

THE REVIEW

DEVOTED TO THE INTERESTS OF THE AMERICAN SOCIETY FOR METALS

Volume XII

NOVEMBER, 1939

No. 9

Papers Invited For Symposium At 1940 Show

Subject Will Include Chemical, Mechanical, Heat and Diffusion Treatments

"Surface Treatment of Metals" will be the subject of the symposium to be presented as part of the technical program of the American Society for Metals at the 1940 National Metal Congress, it has been announced by the Publication Committee of the Society. All members of the A.S.M. are cordially invited to submit papers for this symposium and to bring this notice to the attention of non-members who might be particularly fitted to offer contributions to the subject.

The subject matter will be considered in a broad manner and is intended to include any surface treatment—other than painting or plating, which will be excluded—which might affect the appearance, abrasion or corrosion resistance of a metal.

The subject might be classified under the four headings of chemical, mechanical, heat, and diffusion treatments.

Chemical treatments will be considered to include such subjects as passivating and coloring of stainless steel; proprietary prepainting treatments such as Parkerizing, Bonderizing, and Granidizing; chemical treatment, with or without simultaneous action of electric current, of aluminum, magnesium, copper, and zinc.

Heat Treating Scope Limited

The general subject of heat treatment has been adequately treated in the literature and it is not anticipated that it will be necessary to include papers on other than the surface aspects of this subject. Contributions containing new information on such specific treatments as flame and induction hardening will be welcomed.

Diffusion treatments may include surface impregnation of any metal with any other element. When defined in this manner, carburizing and nitriding must be included, but here again, since the literature is probably adequate, papers on these two subjects should include definitely new data. Contributions on such subjects as the impregnation of steel with aluminum, silicon, chromium, and zinc, are especially solicited.

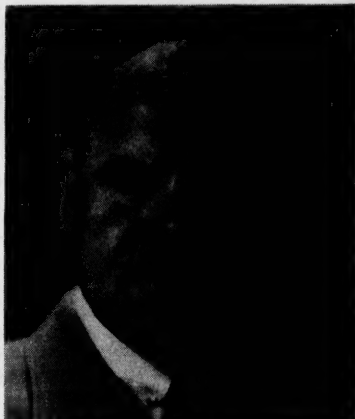
Such subjects as metal spraying, surface working for the improvement of fatigue characteristics, and the general metallurgical effect of smoothness of finish of surfaces might be discussed under the general heading of mechanical treatment.

Authors Should Write Secretary

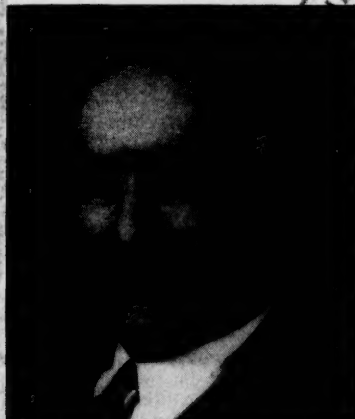
Papers for this symposium should be submitted for the consideration of the Publication Committee by June 20, 1940. Those who contemplate writing a paper for the symposium should communicate with the secretary of the Committee advising him of the content of the proposed paper.

Communications should be addressed to Ray T. Bayless, secretary of the Committee and assistant secretary of the American Society for Metals, 7016 Euclid Ave., Cleveland.

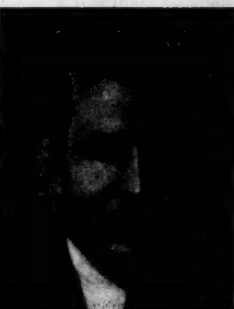
A. S. M. Officers Elected at Convention



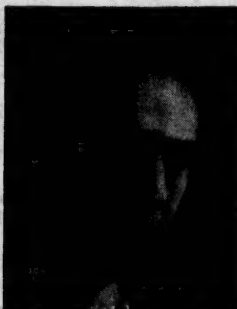
James P. Gill, President



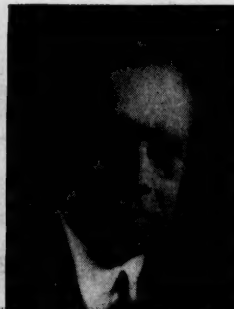
Oscar E. Harder, Vice-President



Kent R. Van Horn
Treasurer



Herbert J. French
Trustee



Marcus A. Grossmann
Trustee

Sauveur-Boylston Course Continued by Dr. E. L. Reed

The Sauveur and Boylston Correspondence Course in the Metallography and Heat Treatment of Iron and Steel, founded in 1904 and in recent years conducted by Prof. H. M. Boylston until his death last July, is now under the management of Dr. E. L. Reed, research metallurgist, Watertown Arsenal.

Dr. Reed was formerly metallurgist in the consulting firm of Sauveur and Boylston, and was subsequently instructor in metallurgy and assistant to the late Prof. Albert Sauveur at Harvard University. He received his doctor's degree from Harvard Engineering School in 1930.

Full particulars about the course can be secured from Dr. E. L. Reed, 11 Westmoreland Ave., Arlington Heights, Massachusetts.

Penn State Hears Herty

By John C. Conte

Penn State Chapter—The introductory meeting for the college year 1939-40, held on Oct. 5, was addressed by Dr. Charles H. Herty, Jr., research metallurgical engineer for the Bethlehem Steel Corp.

Dr. Herty's talk, given before a capacity audience in the Mineral Industries Building on the campus of The Pennsylvania State College, stressed the properties and uses of the three chief tonnage types of steel produced today—namely, killed, semi-killed, and rimmed.

Following the lecture, the speaker graciously answered questions in an open forum discussion.

Largest Show Draws 33,000 To Metal Week

Harmonious Marriage of Technical Programs and Exhibits Credited for Success of National Metal Congress

"A master building block in the sound foundation which has been largely responsible for the Society's success . . . is the harmonious marriage of the technical programs and the exhibits which we are now witnessing for the 21st consecutive year."

These words, quoted from Dr. Zay Jeffries' acknowledgment of honorary membership in the Society, succinctly characterize the success of the 21st National Metal Congress held in Chicago last month.

Exposition Is Largest in History

With an official attendance of 33,000 and with 267 exhibitors, the National Metal Exposition was the largest in history and a fitting and necessary supplement to an outstanding technical program staged by the American Society for Metals, the American Institute of Mining and Metallurgical Engineers, the American Welding Society and the Wire Association.

Dr. Jeffries, technical director, Incandescent Lamp Division, General Electric Co., was awarded an honorary membership in the A.S.M. at the Annual Banquet Oct. 26. A. E. White, director, Department of Engineering Research, University of Michigan, and first president of the Society, was awarded a founder membership.

Other events at the banquet were the award of the Past President's Medal to George B. Waterhouse; of the Henry Marion Howe Gold Medal to Charles S. Barrett, Gerhard Ansel and Robert F. Mehl; of the Sauveur Achievement Award to Stanley P. Rockwell; and a talk on "Science and Steel in Industrial Democracy" by R. E. Desvernine, president of Crucible Steel Co. of America.

Officers' Reports Show Successful Year

Another important activity of the Society during the Congress was the Annual Meeting held on Wednesday morning, Oct. 25, just before presentation of the Campbell Memorial Lecture by E. S. Davenport. At this meeting James P. Gill, metallurgist, Vanadium-Alloys Steel Co., Latrobe, Pa., assumed the chair as incoming president.

Oscar E. Harder, assistant director, Battelle Memorial Institute, Columbus, Ohio, is the new vice-president; and Kent R. Van Horn, research metallurgist, Aluminum Co. of America, Cleveland, treasurer. Marcus A. Grossmann, director of research, Carnegie-Illinois Steel Corp., Chicago, and Herbert J. French, in charge of alloy steel and iron development, International Nickel Co., New York, are two new trustees.

Reports of the retiring officers were presented and reflected a very healthy condition of the Society and completion of another very successful year. These reports will be published in full in the December issue of TRANSACTIONS.

It was announced that the next National Metal Congress and Exposition would be held in Cleveland Oct. 21 to 25, 1940.



Compliments

To Zay Jeffries, technical director, Incandescent Lamp Division, General Electric Co., Cleveland, and past president of the A.S.M., on being conferred an honorary membership in the Society.

To A. E. White, director, Department of Engineering Research, University of Michigan, first president of the A.S.M., on being made a founder member.

To the Cincinnati Chapter A.S.M. on the award of the President's bell and gavel for outstanding chapter activity during the past year.

To Editor Ernest Thum on receipt of the plaque awarded to METAL PROGRESS for first place in the competition conducted by *Industrial Marketing* for the best pictorial reporting work during the past year.

To A. M. Cox, president, Pittsburgh Commercial Heat Treating Co., on his election to the presidency of the Metal Treating Institute; to C. I. Wesley, president, Wesley Steel Treating Co., elected vice-president; to L. A. Lindberg, vice-president, Lindberg Steel Treating Co., elected secretary-treasurer; to C. G. Heilman, president, Commonwealth Heat Treating Co., O. T. Muehle Meyer, president, O. T. Muehle Meyer Heat Treating Co., C. W. Derhammer, president, Lakeside Steel Improvement Co., and W. F. Hamilton, president, Accurate Steel Treating Co., all elected directors of the Metal Treating Institute.

THE REVIEW

Published monthly except July and September by the

American Society for Metals
7016 Euclid Ave., Cleveland, O.

JAMES P. GILL, *President*
OSCAR E. HARDER, *Vice-President*
W. H. EISENMAN, *Secretary*
KENT R. VAN HORN, *Treasurer*
Trustees

D. S. CLARK H. J. FRENCH
F. B. FOLEY M. A. GROSSMANN
W. P. WOODSIDE, *Past President*



Subscriptions fifty cents a year; five cents a copy. Entered as Second Class Matter, July 26, 1930, at the Post Office at Cleveland, Ohio, under the Act of March 3, 1879.

RAY T. BAYLESS.....*Editor*
M. R. HYSLOP.....*Managing Editor*

Cleveland, O., November, 1939
Volume XII No. 9

Harder's "Bird's-Eye View of Metallurgy" Given at Buffalo

By R. F. Cameron

Buffalo Chapter—First regular monthly speaker at the meeting on Sept. 14 was none other than O. E. Harder, assistant director of Battelle Memorial Institute and vice-president-elect of the A.S.M. Dr. Harder's "Bird's-Eye View of Metallurgy" was given from a research viewpoint.

About ten years ago the amount of money spent annually for research was about \$10,000,000 in pure science and about \$200,000,000 in applied science or industrial research. It was indicated that on the basis of the original calculations, both of these figures have been greatly increased, especially in industrial research.

Dr. Harder covered applications of new metals and improvements in old ones from dental surgery through to pit type corrosion in stainless steels.

In the jewelry field cobalt has been added to gold alloys as a hardener. In the dental field platinum centered gold foil gives increased strength to inlays. Stainless base metal alloys have been developed and are being used in dentistry in place of precious metal alloys.

In the automotive field excellent results are being obtained with cadmium base and silver alloys for bearings, while improvements in exhaust valves have given better strength at operating temperature, better hardness and corrosion resistance.

In the oil industry work is being done to improve sucker rods, still tubes and supports against corrosion fatigue, and to reduce creep in heat resisting alloys.

Most of his thoughts on machinability were directed to the improved results obtained from leaded steels. Dr. Harder feels that lead can be added to a wider range of steels, even those not now considered suitable for improved machining.

In the low alloy, high yield steels the use of phosphorus, copper, manganese, silicon, nickel, molybdenum and chromium has been successful in raising the yield values and at the same time reducing the dead weight.

Molybdenum, titanium, columbium and cobalt have been successful in reducing intergranular and pit-type corrosion in stainless steels.

The application of the principles of precipitation hardening in the non-ferrous field has enabled a better and wider application of these alloys.

Die Casting Industry Shows Rapid Growth

Applications 10 Years Ago Mainly Ornamental; Production Now Approaches 200,000 Tons

By John E. Wilson

Los Angeles Chapter opened its 1939-40 season auspiciously on Sept. 14 when over 100 persons attended the premier presentation by the Harvill Aircraft Die Casting Corp. of a colored talking motion picture entitled "Die Casting the Modern Way".

The motion picture was preceded by short talks by H. L. Harvill, president of the Harvill Corp., and W. W. Broughton of Morris P. Kirk & Son, Inc.

It was interesting to many not intimately connected with the industry to learn of its rapid growth. Ten years ago die castings were used principally for ornamental purposes. Today the total tonnage of die castings, ranging in size from a few ounces to over 50 lb., approaches 200,000 tons per year.

High Pressures Used

It is general practice in this country to use fairly high pressures to force the molten metal into the dies. The capacity of a die casting machine used by Harvill Aircraft Die Casting Corp. is in excess of 50,000 psi., but it has been found by experience that there are certain limits that will produce the most desirable structure with a given alloy.

For zinc alloys this limit is 1000 to 1200 psi., for aluminum and magnesium alloys 6000 to 9000 psi., and copper alloys 13,000 to 18,000 psi. Any attempt to exceed these limits shortens the life of the dies without noticeably improving the properties of the casting.

The alloys which have proven to be the most readily adapted to the needs

Springfield Hears At First Hand of New Bonded Carbide

By A. J. Carruthers

Springfield Chapter—The unusual opportunity of hearing first hand the latest developments in a highly specialized metallurgical field was presented at the first meeting of the current season on Sept. 18, when Philip M. McKenna of the McKenna Metals Co. discussed the topic "Recent Developments in Bonded Carbides".

Mr. McKenna gave a review of his talk before the Los Angeles Chapter last March which was enthusiastically received by the total A.S.M. membership when it was published in the August issue of METAL PROGRESS.

That article gives complete details of his method of synthesizing complex carbides which is quite different from the ordinary process.

During the course of his lecture Mr. McKenna presented a series of slides depicting the manufacture of these new compounds and some of their outstanding performance feats.

At the conclusion of his talk Mr. McKenna presented a significant display of steel turnings both large and small, each telling its own story. Among the most interesting of these were the turnings taken from interrupted or jump cuts performed by both straight turning tools and a newly developed milling cutter.

The lively discussion that followed the talk was one from which any metallurgist connected with this phase of modern machine tool practice could very well profit.

Discuss Die Casting



W. W. Broughton (Left) and H. L. Harvill (Right) Were Speakers at a Meeting of the Los Angeles Chapter

of the die casting industry may be classified as follows:

1. Alloys using zinc as the major constituent and having a tensile strength of 35,000 to 55,000 psi., elongation of 4 to 10% in 2 in., and impact strength of 15 to 20 ft.-lb. using a ¼-in. square Charpy bar.
 2. Alloys using aluminum as the major constituent and having a tensile strength of 29,000 to 35,000 psi., elongation of 2 to 4% in 2 in., and an impact strength of 1½ to 5 ft.-lb.; weight 0.095 to 0.110 lb. per cu.in.
 3. Alloys using magnesium as the major constituent and having a tensile strength of 30,000 to 35,000 psi., elongation of 1½ to 5% in 2 in., and impact strength of 1 to 3 ft.-lb.; weight 0.066 lb. per cu.in.
 4. Alloys having copper as the major constituent and having a tensile strength of 55,000 to 75,000 psi., elongation of 10 to 45%, and impact strength of 30 to 36 ft.-lb.
- The undesirable shrinkage characteristics of copper-aluminum alloys may be minimized by the addition of up to 12% silicon.

Die Steels Are Important

The dies which are used cause considerable concern, especially when casting alloys having a high melting point.

On dies for zinc alloys (having a relatively low melting point) practically any type of steel may be used even going to cast iron for short runs. For long runs of over a million parts a heat treated steel similar to S.A.E. 6140, 3145 and 4145 is preferable.

Dies used for magnesium and aluminum castings are generally made from heat treated S.A.E. 3145, 4145 and 6140.

Although a considerable amount of investigation has been conducted, a really satisfactory die steel for the brasses has not yet been developed.

The care and procedure used in making the dies, the melting and pouring practice, as well as the application of the finished casting, were very interestingly portrayed.

Photo-Elasticity Illustrated

Puget Sound Chapter—The members were privileged to witness a most unusual illustration on "Photo-Elasticity" given by Professor McMinn, Engineering Department of the University of Washington, at the meeting on Oct. 4.

Professor McMinn dwelt at some length on the application of polarized light in making a study of stress concentration using as a medium the various plastics.

Professor McMinn had spent a great deal of time in the preparation of this discussion and showed the members that all apparatus can be assembled in necessary form with comparatively inexpensive material.

York Honors Long Service of First Chairman

Chapter Now 10 Years Old Celebrates Birthday With George J. O'Neill Presiding

By A. Floyd Whalen

York Chapter opened its eleventh season on Sept. 20. Chairman Jim Morrison opened the meeting by remarking that on the completion of ten years of the Chapter's work, it was only fit and proper that the man who had done the most for the Chapter during all those years should have the honor of presiding at this meeting.

That man was one of its promoters, one of its organizers, its first chairman, and its most faithful and earnest supporter ever since—Mr. George J. O'Neill. Past Chairmen Norman Gebbert and Floyd Whalen acted as an honor guard and conducted him to the chair.

Responding to prolonged applause, genial George acknowledged the honor and then reviewed many of the events of those years that were prominent in his memory. Many followed him in their own memories, for there were present ten members of the original 19 who were present on that historical night in September 1929, and who had retained their membership continuously during those years.

Considering the fact that the depression broke one month after the Chapter organized it was very gratifying to know that the Chapter survived and now has a membership of approximately 100.

George V. Luerssen, metallurgist of the Carpenter Steel Co., presented an illustrated lecture on the "Manufacture and Inspection of Tool Steel".

Mr. Luerssen's lecture took the form of three reels of moving pictures, which he had taken himself for the purpose of educational work in his own organization. Primarily prepared for the metallurgical and inspection departments, it has proven very helpful to the production end of the plant, and the sales department rates it as their most valuable asset.

Three Speakers Give Data on Stainless

By N. A. Pyle

Baltimore Chapter—The program at the first regular dinner meeting on Oct. 16 featured three very capable speakers from the Rustless Iron and Steel Corp.

These speakers presented for the first time original data on the machinability of stainless steel developed by research at Rustless Iron & Steel during the past three years.

The first speaker was Wm. B. Pierce, sales manager of Rustless, who discussed the relationship between actual research work and the practical result desired or obtained. He pointed out that research work today is a combination of laboratory experiment and actual shop experience.

Mr. Pierce then introduced the second speaker, H. S. Schaufus, chief metallurgist. Mr. Schaufus discussed the various metallurgical problems connected with the machinability of stainless steels and the results obtained through both practical and metallurgical research.

George Stevens, research machinist, then gave an interesting and informative discussion of shop practice.

At the conclusion of these talks, the company had quite a few samples on display which evoked much interest.

Cleveland Chapter Joins With Rotary Club for Special Meeting



At the Head Table During the Cleveland Chapter and Rotary Luncheon Meeting Are J. Edward Donnellan, Ray T. Bayless, and Ernest E. Thum of the National Office; Harry D. Churchill, Chairman of the Cleveland Chapter; Kent R. Van Horn and William P. Woodside, Treasurer-Elect and President of the Society, Respectively; A.S.M.-Rotary Members C. M. Buss, Wm. H. Eisenman (National Sec. A.S.M.), J. W. Kelley, G. A. Yost, A. E. Gibson, Wm. H. White, Victor J. Tlach

Value of Metals in Daily Life Stressed At Rotary Session

National and Cleveland Chapter Officers Attend

On Thursday noon, Oct. 12, the Cleveland Chapter of the American Society for Metals met in joint session with the Rotary Club of Cleveland for the purpose of honoring the work of metallurgists.

National officers, Cleveland Chapter officers and those persons holding memberships in both A.S.M. and Rotary were at the head table.

President W. P. Woodside of Detroit, Secretary W. H. Eisenman, Treasurer-Elect Kent R. Van Horn and Cleveland Chapter Chairman H. D. Churchill, as well as Assistant Secretary Ray T. Bayless, METAL PROGRESS Editor E. E. Thum and J. Edward Donnellan of the national office, were Society officials honored.

Joint A.S.M.-Rotary Members J. W. Kelley, Alfred E. Gibson, Victor Tlach, W. H. White, George A. Yost and Wakeman C. Bell, as well as Mr. Eisenman, were also at the speakers' table.

Numerous door prizes of metal were given, stressing the importance of the material in everyday life. Garden tools, fishing rods, knives, cooking and serving utensils were among the prizes.

Following the introduction of head table guests by Mr. Eisenman, President Woodside spoke briefly and showed the Climax Molybdenum sound picture entitled "Panorama of Alloy Steels".

This meeting was the first event in a public relations program recently made available to chapter chairmen and public relations chairmen by the national office for the purpose of emphasizing the value of metals and metallurgists to everyday life. Other similar meetings are being planned in various A.S.M. cities.

Stagg Attributes Failures Of Steel to Three Causes

By Randall J. Salzer

Rochester Chapter held its 181st meeting at the University of Rochester on Monday evening, Oct. 9.

The members were particularly fortunate in having for their dinner speaker Mrs. Rhoda Thomas, one of the survivors of the "Athenia", who gave a vivid description of her adventure.

The technical address of the evening on "Steel Failures" was given by Howard Stagg, of the Crucible Steel Co. of America.

Steel failures were reported to be generally attributed to three common causes: (a) Design, (b) specification of the material, and (c) heat treatment.

Mr. Stagg's discussion of this popular subject, together with his simple, direct presentation, was enthusiastically enjoyed by several hundred guests.

Cups and Prizes Donated At Sixth Annual Golf Party

By J. H. Birdsong

Buffalo Chapter held its Sixth Annual Golf Party and get-together meeting on Sept. 8 at the Orchard Park Country Club.

Only members of the Society were eligible to compete for the two cups offered for the golf tournament.

The one donated by the Hotel Buffalo was won by William Rodgers of Republic Steel Corp. on the kickers handicap, while the cup donated yearly by Brace-Mueller-Huntley, Inc., for low net was won by H. Simon.

About 15 other prizes, including such things as golf bags, balls, and electric clocks, were given for various scores and door prizes.

Following the 19th hole, a steak dinner was served to about 70 members and friends and was followed by a floor show.

Afterwards, a certain Navy Inspector who is a whiz at the piano was kept busy by the crowd until the small hours.

The Chapter feels that such an outing more than fulfills its function of making those present more intimately acquainted.

Aging Phenomena Elucidated by French

By C. A. Nagler

North West Chapter held its first meeting of the 1939-1940 season at the University of Minnesota Union, in Minneapolis. The speaker of the evening was H. J. French, in charge of alloy steel and iron development of the International Nickel Co., and trustee-elect, A.S.M., who spoke on "Special Alloy Steels and Their Age Hardening".

The speaker described theories of the mechanism of aging and the resultant changes in physical properties, using many examples to clarify the material.

A method for the avoidance of stretcher straining is the removal of the yield point elongation property of the metal by a small cold reduction on a temper roll.

Another point brought out was that the smaller the grain size the greater the yield point. The presence of nickel in a steel is found to inhibit aging embrittlement and grain growth.

Examples of aging embrittlement in hot galvanizing were cited. Temper embrittlement is one manifestation of aging embrittlement.

An important factor influencing aging properties of the steel is the method of manufacture.

Alloy steels containing copper were cited to illustrate age hardening and critical dispersion. Ferrite is harder and stronger than copper, but if the copper is made to disperse itself in the ferrite, the resulting elastic and strength properties are better than

If War Again Comes to U. S., Industry Will Be Prepared Says Ordnance Officer

Army and Industry, Working Together, Have Laid Out Comprehensive System Known as "Protective Mobilization Plan"

By Fred P. Peters

New Jersey Chapter—If the misfortune of war should again befall this country, industry will be prepared for immediate and rapid production of necessary war materials, Colonel J. K. Clement, executive officer of the New York Ordnance District told a joint meeting of the New Jersey Chapters of the A.S.M. and the American Society of Tool Engineers on Oct. 17.

The serious delay experienced in 1917 in manufacturing vital munitions, equipment and aircraft will not be repeated in the next emergency, for the Army and industry, working together, have already laid out a comprehensive system for assuring industrial preparedness.

The "Protective Mobilization Plan", authorized by Congress three years ago with the appropriation of sufficient funds, is based on the already-determined capacity of industry to furnish materials for the first few months of hostilities involving this country—or in other words, to provide adequate material for the "Initial Protective Force" of 450,000 men (regular army, reserve corps, National Guard units, etc.) that can be mobilized on "M-day".

The necessary munitions and equipment cannot be manufactured and stocked in advance because of the great cost of such advance preparation, the susceptibility to deterioration of many munitions, and the fact that the exact nature of such supplies will depend on actual war plans, which are, of course, subject to military exigencies of the moment. Through consultation with manufacturers and examination of plant facilities during the last two years, Ordnance officers have been able to determine what the cooperating plants in each of 15 Ordnance districts can supply and how fast the supplies can be produced when needed.

"Educational" Orders Placed

Procurement planning is, of course, predicated on plans, specifications and estimates, which already have been carefully prepared, except for certain very recently developed items. Non-commercial materials require "educational" of manufacturers, and for this purpose "educational" orders designed not only to familiarize manufacturers with technique, machine tools and other equipment required but to provide a

those of the iron alone. The soft material increases the hardness of the harder material.

Mr. French gave typical compositions of steels which are known to have age hardening possibilities.

At the close of the talk there was a very lively discussion which indicated that the members really enjoyed it.

basis for estimating costs, are now being placed.

This year 50 items of an "educational" nature will be ordered by the Army, with \$150,000,000 appropriated for procurement (mostly from private industry) during the 1940 fiscal year. Over \$6,000,000 will be expended on retooling the Army's arsenals, over 80% of whose machine tools are said to be more than 18 years old. In addition, the last Congress provided for the procurement of strategic raw materials.

New Rifle Demonstrated

Colonel Clement's interesting and timely talk was followed by a demonstration by Captain F. E. Dunn of the 16th Infantry, of the new Garand semi-automatic rifle. The new rifle, based on 20 years of development work, is gas-operated and combines the good features of the Browning automatic and the Springfield rifles with, however, none of their disadvantages.

Among the outstanding features of the new gun are its light weight (8.9 lb.), the sturdy front-sight construction, the ease of break-down and assembly, the non-cloggable gas-port, and the simple, one-piece bolt construction which guarantees that nothing but the firing-pin will be in motion at the instant before actual firing of each bullet.

Those present left the meeting with a sense of security in this country's industrial preparedness and in the efficacy of at least one of her military weapons. But this reporter must confess that he'd feel his own personal security had reached a new low if, right now, keeping body and soul together in the face of a destruction-bent enemy depended on his re-assembling that gun one tenth as fast as Captain Dunn had done it.

First Meeting Forecasts Successful Calumet Season

By E. P. Epler

Calumet Chapter—If the first meeting of the year gives any indication as to the success for the balance of the season, Chapter Chairman F. S. Sutherland and his program arrangers are open for an advance congratulation for a highly educational and entertaining season.

First Dr. Adams of the Standard Oil Co. gave a fine talk on Du Pont's new product "Nylon", a silk substitute, which he exhibited as ladies' hosiery.

The featured speaker of the evening was Francis B. Foley, superintendent of research of the Midvale Co., who spoke on the properties and treatment of ferritic, austenitic and martensitic stainless steels. His talk was accompanied by numerous slides which amply illustrated his most important ideas.

Differential Hardening by Induction Heat Accurately Controls Surface Hardness

By G. G. Wilcox

Hartford Chapter — The opening meeting of the current season, held on Oct. 10, took the form of a joint session with the Southern New England Section of the Society of Automotive Engineers.

Following an excellent dinner at the City Club, the large number present were privileged to view some enlightening movies taken at the Chapter's annual outing last spring.

Benninghoff Is Speaker

Speaker of the evening was W. E. Benninghoff, manager of Tocco Division, Ohio Crankshaft Co.

Mr. Benninghoff gave a straight-forward and very interesting talk on the theory and application of "Differential Hardening by Induction". This method was developed by the Ohio Crankshaft Co. and is known as the "Tocco Process".

The process in brief produces local surface spot hardening under very accurate control, using electric induction as a heating means.

The speaker first briefly explained the theory underlying the method. The fact that heat may be generated in the surface of a part, as at the bearing surfaces of a crankshaft, is due to three

electrical effects, namely hysteresis, eddy currents, and skin effect.

Heating by hysteresis results from the molecular friction caused by the rapid reversal of magnetic polarity in the object being treated. This effect naturally takes place only at temperatures up to the critical range.

Alternating current of high frequency is necessary for heating rapidly, and also for the skin effect which confines the heating very largely to the surface.

Heating above the critical range takes place relatively slowly, since only eddy currents, and not hysteresis, are effective in this temperature range.

In practice, the part to be hardened is inserted inside a coil, generally cylindrical in shape, called an inductor block. The part thus forms a core in a high frequency field. Quenching is done in place, and consists of a high pressure water spray directed at the part through a series of small holes in the inductor block itself.

Automatic Control Employed

All essential parts of the operation, such as heating cycle, current input, quenching pressure and quenching time, are automatically controlled. Heating and quenching times are very short, on the order of a few seconds each, and

are controllable to within ± 0.05 sec. Using a small demonstrator unit, Mr. Benninghoff showed the extremely rapid heating obtainable.

The big application of Tocco hardening is for crankshaft and similar bearings where wear and abrasion are a problem and where it is desired to have only the bearing surfaces hard. The extent and depth of the area hardened are under very close control.

The hardness may be controlled from a full hardness down to some 10 or 15 Rockwell numbers lower. This may be accomplished by a delayed quench, or by stopping the quench at a low temperature and allowing self tempering to take place.

Crankshaft bearing surfaces are commonly produced with a hardness of Rockwell C-60. The depth of penetration is on the order of $\frac{1}{8}$ to $\frac{1}{4}$ in. and there is a gradual decrease in hardness in the gradation zone between the hardened surface and the core so that a strong bond is assured.

Current frequencies of 2000 to 3000 cycles per sec. are ordinarily used; the smaller or thinner the part to be hardened, the higher the frequency. Frequencies run up to 200,000 on small parts.

Many interesting slides of Tocco hardened parts and the microstructures developed in the hardened areas were shown, and a lively discussion period following the lecture brought out a number of additional points of interest.

Possibilities of Metal Powders Are Various

Pioneer in Field Traces History, Outlines Present Status, Looks Into Future

By Charles A. Nagler

North West Chapter—One of the pioneers in the relatively new field of powder metallurgy was the principal speaker at the October meeting. He is L. L. Wyman, research laboratory, General Electric Co., Schenectady, N. Y., who is largely responsible for the development of spot welding electrodes and cemented carbides.

In 1829 W. H. Wollaston described a method of forming wire from chemically pure platinum. This was to moisten the platinum powder and press into a suitable mold, then sinter the powder in a furnace using a special coal.

Powder metallurgy was then forgotten until the year 1912 when ductile tungsten was first developed. The powder of tungsten, which was produced chemically and of very fine particle size, was compacted and then sintered by its own electrical resistance and then the metal was swaged and drawn to the desired size.

Porous Bearings Developed

The original porous bearings were made from the oxides CuO, SnO and ZnO, mixed together with graphite and compressed and sintered so diffusion could take place. Modern porous metal (oil-less) bearings are made by compacting and sintering the pure metals with graphite.

Powder metallurgy made possible the formation of cemented carbide tools and opened up a new field of industry. This type of tool provides higher cutting speeds and deeper cuts, as well as new wire drawing dies.

Alnico magnets, made by powder metallurgy, require very little grinding, sometimes none at all. The metals are mixed in the proper proportions, slightly sintered, filed to the desired finished shape, and then given the finish sintering operation.

By powder metallurgy it is possible to mix metals, or even metals and non-metals, which have no affinity for each other. A good example is Ag, PbO and Mo which form an excellent electrical contact.

Products Come Under Two Types

At present there are two types of products made by powder metallurgy; one is solid and the other may have a porosity as high as 38%. These two types may be divided into five classes:

1. Refractory metals which include tungsten, molybdenum and tantalum.
2. Electrical contacts and electrode materials. (Copper which has been absorbed in its molten state by a porous tungsten bar is an example of a weld electrode mixture; a silver face with a steel back forms an electrical contact.)
3. Porous metals.
4. Cemented carbides.
5. Magnets and Curie metals, the latter having the property of changing their magnetic properties as they are heated and cooled through the critical temperature.

Mr. Wyman stressed the point that it is not a question as to what powder metallurgy can do but rather how much does it cost and can parts be produced cheaper than by some other method.

It is possible to produce metal combinations which would be impossible were it not for powder metallurgy. There is practically no loss nor waste in powder metallurgy and therefore no large scrap heaps.



Dr. Edgar C. Bain

Assistant to the Vice-President of the United States Steel Corporation

PRESENTS

"Functions of the ALLOYING ELEMENTS IN STEEL"

312 pgs. . . . 186 ill.
6 x 9 . . . red cloth bound
\$3.00
(until Dec. 15)

● A subject of fundamental importance to every member of the ASM — alloying elements in steel — is covered in this well-written book by Dr. Bain.

The largest group ever to attend an educational series heard Dr. Bain present his material at the Chicago Metal Congress. Their enthusiastic reception of his remarks on carbon steels . . . alloying elements . . . hardenability . . . tempering, was a tribute to the painstaking effort which went into the preparation of this material.

Available in a well-made, 6 x 9 book containing 312 pages with 186 interesting illustrations, these lectures make simple the understanding of the fundamental facts which have to do with the functions of alloying elements in steel. Until December 15 this book will be available at the introductory price of \$3.00 (\$4.00 later).

Use the handy coupon at the left to order your copy today.

● Dr. Bain has been assistant to the vice-president of U. S. Steel Corp. since 1935, having spent the preceding seven years in the Corporation's research laboratory where he inaugurated and carried through a program of research which has revolutionized the classical concept of steel metallurgy.

American Society for Metals
7016 Euclid Avenue
Cleveland, Ohio

Gentlemen: Please send me a copy of Dr. Bain's new book "Functions of the Alloying Elements in Steel." I am enclosing \$3.00 in cash (), money order (), check ().

Name _____

Address _____

City _____ State _____

Educational Activities Vary in Subject and Approach

Chapters Sponsor All Types of Lectures, Discussion Groups

Two New Courses Added to List of Those Available From National Office

A diversity of subjects will be treated in the educational activities of the various chapters of the Society this year. These subjects will be approached from a fundamental or theoretical viewpoint, presented in formal lecture courses or informal discussion groups.

Many of these activities are based on courses available in printed form and accompanied by lantern slides supplied by the National Office of the A.S.M. Two new courses of this type are being made available this fall, one based on lectures presented by E. C. Bain at the National Metal Congress last month, and a second based on a series of lectures presented two years ago before the Pittsburgh Chapter.

The complete list of these courses is as follows:

Functions of the Alloying Elements in Steel, by E. C. Bain
Modern Steels
Metals—How They Behave in Service
Machining of Metals
Open-Hearth Steel Making, by Earnshaw Cook
Physical Testing of Metals, by H. D. Churchill
Tool Steels, by J. P. Gill
Principles of Heat Treatment, by M. A. Grossmann
Fundamentals of Ferrous Metallurgy, by A. Allan Bates.

A cross-section of the programs so far planned by the chapters is shown below.

BALTIMORE CHAPTER

The educational program tentatively arranged last year to extend over several years is being continued, and a book of notes for the second series of lectures will shortly be released.

CALUMET CHAPTER

A series of ten weekly lectures is presented every Thursday at Roosevelt High School, East Chicago, Ind. Dates, subjects and lecturers are as follows:

Nov. 2—Lead Bearing Steels; James W. Halley, Inland Steel Co.
 Nov. 9—Heat Resisting or Corrosion Resisting Steels; D. L. Simpson, Carnegie-Illinois Steel Corp.
 Nov. 16—Progress of Alloy Additions to Steel; G. K. Manning, Republic Steel Corp.
 Nov. 30—Progress of Alloy Additions to Steel Castings; W. B. Libert, Continental Roll & Steel Foundry.
 Dec. 7—Non-Destructive Testing; D. E. Wilson, Edward Valve Co.
 Dec. 14—Destructive Testing; E. P. Epler, Carnegie-Illinois Steel Corp.
 Jan. 11—Interpretation of Test Results; O. W. McMullan, Youngstown Sheet & Tube Co.
 Jan. 18—Special Steels; A. J. Scheid, Columbia Tool Steel Co.
 Jan. 23—Cold Working; F. J. Robbins, Bliss & Laughlin, Inc.
 Feb. 1—Thermit Welding; C. D. Young, Metal & Thermit Corp.

CHICAGO CHAPTER

Two types of educational activities are presented: A "Fundamental Series" and a "Metallurgical Seminar".

Fundamental Series

The first five lectures are based on Dr. Grossmann's course on "Principles of Heat Treatment". The course is held at the Chicago Lighting Institute, 7:15 to 8:45 p.m.

Nov. 13—Principles of Hardening.
 Nov. 16—Principles and Variations of Hardening.
 Nov. 20—Normalizing, Tempering, Hot Quenching.
 Nov. 23—Case Hardening, Grain Size, Annealing.
 Nov. 27—Iron Carbon Diagram; Equipment for Heat Treating; Commercial Heat Treating Data.
 Jan. 18—Research in Heat Treatment: Dilatometric Studies of Heat Treatment; N. A. Ziegler, Research Metallurgist, Crane Co.

Jan. 25—Research in Heat Treatment: Anomalies of Heat Treatment; N. A. Ziegler.
 Feb. 15—Magnetism in Metals; K. L. Scott, Electrical Engineer, Western Electric Co.
 Feb. 29—Metallurgical Analysis by the Spectrophotograph; H. B. Vincent, Research Physicist, University of Michigan.

Metallurgical Seminar

For those interested in round table discussion of metallurgical subjects with particular reference to the more advanced theories, a course of four discussion conferences is offered. Members attending this series of conferences are warned to come prepared to engage actively in the discussion. They are held in the Carnegie-Illinois Steel Corp. auditorium from 7:30 to 10:00 p.m.

Sept. 28—Hardenability.
 Nov. 2—Question Night.
 Mar. 7—Fatigue of Metals; H. F. Moore, University of Illinois, Discussion Leader.
 Mar. 28—Physics of Metals; S. Freed, University of Chicago, Discussion Leader.

CINCINNATI CHAPTER

Educational activities are conducted by groups of members holding regular monthly discussion meetings. Three groups have so far been organized, one on "Practical Application of Heat Treatment", one on "Machinability", and a "Miscellaneous Group".

CLEVELAND CHAPTER

Two separate courses are being presented, on "Precipitation Hardening" and "Plastic Deformation of Metals". With each lecture will be incorporated a general discussion period. Meetings are scheduled for Monday evenings in the lecture room of the Physics Building at Case School of Applied Science.

Course I—Precipitation Hardening

Lecturer—L. W. Kempf, Research Metallurgist, Aluminum Co. of America.
 Nov. 20—Principles.
 Nov. 27—Practical Applications.

Course II—Plastic Deformation of Metals

Lecturer—George Sachs, Assistant Professor of Metallurgy, Case School of Applied Science.
 Jan. 22—Principles of Working Processes.
 Jan. 29—Rolling.
 Feb. 19—Forging.
 Feb. 26—Extrusion.
 Mar. 18—Drawing of Rods, Wire and Manufacture of Tubes.
 Mar. 25—Deep Drawing and Other Fabricating Processes.

GOLDEN GATE CHAPTER

The evening public school courses in practical metallurgy which have been sponsored by the Chapter for many years are being continued. These are conducted by the Samuel Gompers Trade School in San Francisco and include five classes of laboratory and general instruction in both ferrous and non-ferrous metallurgy. Any man employed in any of the metal industries, and residing in any of the Bay Counties, is eligible for enrollment in these courses.

LOS ANGELES CHAPTER

A series of five lectures on "Physical Testing and Its Interpretation" will be presented at a time and place to be announced later. Tensile, fatigue, hardness, bend, and torsion testing will be the respective subjects of the five lectures.

MILWAUKEE CHAPTER

"Forgings" is the subject of a course being presented during November and December at Marquette University, meeting evenings at 7:30 p.m. Dates, subjects and speakers are:

Nov. 6—Forging Steels; John Harding, Metallurgist, Carnegie-Illinois Steel Corp.
 Nov. 13—Forging Practice; A. R. Netterstrom, General Superintendent, American Forge Division, American Brake Shoe and Foundry Co.
 Nov. 20—Forging and Die Design; Cedric Olson, Metallurgist and Superintendent, Unit Drop Forge Co.
 Nov. 27—Heat Treatment of Forgings; E. O. Dixon, Chief Metallurgist, Ladish Drop Forge Co.
 Dec. 4—Stainless Steel Forgings; Ernest Johnson, Assistant Chief Metallurgical Engineer, Republic Steel Corp.

Dec. 19—Heavy Forgings; A. O. Schaefer, The Midvale Co. (Regular monthly Chapter meeting).

MUNCIE CHAPTER

The Chapter is cooperating with the vocational division of the Muncie city schools in an extensive training course in metallurgy. The course meets one night each week and consists of lectures, discussions and laboratory work. It is patterned on the 1939 A.S.M. Metals Handbook.

NEW HAVEN CHAPTER

A special lecture program is being held weekly during the fall at Hammond Laboratory, Yale University. The schedule is as follows:

Oct. 30—Classifications of Metals; A. D. Eplett, Chief Metallurgical Engineer, Manning, Maxwell and Moore, Inc.
 Nov. 6—Plain and Alloyed Cast Irons; G. L. Richter, Metallurgist, Farrel Birmingham Co., Inc.
 Nov. 13—Carbon Steels; W. N. Van Tassel, Ferrous Metallurgist, Scovill Mfg. Co.
 Nov. 20—Alloy Constructional Steels; D. A. Nemser, Development and Research Engineer, The International Nickel Co.
 Nov. 27—Light Non-Ferrous Alloys; H. C. McKay, Jr., Metallurgist, Aluminum Co. of America.
 Dec. 4—Heavy Non-Ferrous Alloys; W. S. Girvin, Assistant Metallurgist, American Brass Co.

NEW JERSEY CHAPTER

Three lectures on "Engineering Applications of Metals and Alloys" by Norman E. Woldman, Chief Metallurgical Engineer, Eclipse Aviation Division of Bendix Aviation Corp., constituted the fall educational course. Meetings were held at 8:00 p.m. at the Essex House, Newark, as follows:

Oct. 30—Ferrous Alloys: Carbon Steels, Low Alloy Steels, Cast Irons.
 Nov. 6—Ferrous Alloys: Corrosion and Heat Resistant Alloys, Tool and Die Steels.
 Nov. 13—Non-Ferrous Alloys: Copper Base Alloys, Aluminum Base Alloys, Magnesium Base Alloys.

A second course is scheduled for the spring on the subject of "Machinability". The tentative schedule covers four meetings.

Jan. 15—Physics of Cutting; Hans Ernst, Cincinnati Milling Machine Co.
 Jan. 22—Machinability of Ingot Iron, Wrought Iron, S.A.E. Steels and Stainless Steels.
 Jan. 29—Machinability of Tool Steels.
 Feb. 5—Machining of Non-Ferrous Metals.

NEW YORK CHAPTER

Nature and significance of corrosion is the subject of a course starting next January. The lectures will be given in the rooms of the Merchants' Association, 9th floor, Woolworth Bldg., and friends and guests are welcome as well as members.

Jan. 9—The Nature and Significance of Corrosion; Robert J. McKay, The International Nickel Co.
 Jan. 16—The Nature of Corrosion—Demonstrations; F. L. LaQue, The International Nickel Co., Inc.
 Jan. 23—Principles and Practice of Corrosion Testing; L. W. Hopkins, American Chain & Cable Corp.
 Jan. 30—Influence of Composition and Treatment, With Particular Reference to Iron and Steel; C. P. Larrabee, Corrosion Laboratory, Carnegie-Illinois Steel Corp.
 Feb. 6—The Prevention of Corrosion; R. M. Burns, Bell Telephone Laboratories.

PHILADELPHIA CHAPTER

Temple University continues to cooperate with the Philadelphia Chapter in offering a "Practical Evening Course in Heat Treatment and Metallography of Steel". Students attend two nights a week, receiving both lecture and laboratory instruction. In addition to the one-year elementary course, there is an advance course leading to a certificate in metallurgy.

"Metals—Inside Out"

Under this title a more advanced and specialized course will be conducted later in the year. The six lectures are as follows:

1. Basic Architecture; A. W. Grosvenor, Drexel Institute.
 2. Effects of Alloying on the Architecture; Frederick Seitz.

3. Hardness; W. J. Diederichs, Autocar Co.
 4. Under the Microscope; R. R. Moore, U.S. Navy Yard.
 5. Strength; F. B. Foley, The Midvale Co.
 6. Impurities; A. H. Staud, W. B. Coleman Co.

PITTSBURGH CHAPTER

This year the most recent and practical developments in metallurgy, rather than elementary principles, are stressed in the educational lecture series. There is no registration and no entrance fee for either members or non-members. The meetings are held at 8:00 p.m. in the Bureau of Mines Auditorium.

Sept. 28—Statistical Analysis of Metallurgical Problems; E. M. Schrock.

Oct. 19—Selection of Water, Oil and Gas Quenching Media for Trouble-Free Hardening of Steel; Howard Scott.

Nov. 30—Some Aspects of the Mechanics of Machining; Y. J. Bruce.

Jan. 25—Significance of Grain Size; E. C. Bain.

Feb. 29—Modern Trends in Open-Hearth Practice; R. C. Good.

Mar. 28—Summary of Recent Developments in Metallography; A. A. Bates.

Apr. 25—Application of Micro-Analysis to Metallurgy; H. V. Churchill and W. E. White.

ROCHESTER CHAPTER

For the fourth consecutive year Prof. William J. Conley of the Department of Engineering, University of Rochester, is conducting the educational course. The subject this year is "Metallography of Metals and Alloys". The microstructure is studied by means of slides, supplemented by lectures to show the relation between the structure and physical properties. Practical illustrations show how this information can be of help in choosing metals and alloys for specific industrial applications. The lectures are held at 7:15 p.m. in Room 208, Engineering Building, University of Rochester.

Sept. 25—Preparation of Metals and Alloys for Microscopic Examination.

Oct. 2—Brass and Bronze, Cast.

Oct. 16—Brass and Bronze, Hot Worked.

Oct. 30—Aluminum Alloys, Cast and Hot Worked.

Nov. 6—Die Casting Alloys.

Nov. 20—Bearing Alloys.

Dec. 4—Cast Iron, General.

Dec. 18—Cast Iron, Special.

Jan. 15—Cast Steel.

Jan. 22—Steel Ingot Iron and Wrought Iron.

Feb. 5—Low Alloy Steel.

Feb. 19—High Alloy Steel.

Feb. 26—High Alloy Steel.

Mar. 4—High Speed Steel.

Mar. 18—Stainless Iron and Steel, Cast.

Mar. 25—Stainless Iron and Steel, Hot Worked.

Apr. 1—Permanent Magnet Alloys.

Apr. 15—Special.

Apr. 22—Corrosion as Related to Microstructure.

Apr. 29—Failures as Related to Microstructure.

ST. LOUIS CHAPTER

Bates's course on "Fundamentals of Ferrous Metallurgy" is being presented on Wednesday evenings in the auditorium of the Laclede Gas Light Co. The \$2.00 fee includes the complete set of eight printed lectures.

Oct. 18—Production of Pig Iron; F. X. Hahn, Chief Chemist, Scullin Steel Co.

Nov. 1—Steel Making; F. X. Hahn.

Nov. 8—Steel Making; F. X. Hahn.

Nov. 15—Ingots, Solidification and Crystallization; F. X. Hahn.

Nov. 22—Physical Metallurgy of Steel; M. E. Meyerson, St. Louis Testing Laboratories.

Nov. 29—Development of the Iron Carbon Equilibrium Diagram; M. E. Meyerson.

Dec. 6—Theory and Practice of Steel Treatment; C. B. Swander, Chief Metallurgist, Wagner Electric Corp.

Dec. 13—Theory and Practice of Steel Treatment; C. B. Swander.

WORCESTER CHAPTER

Offering practical education covering the many phases of metal behavior encountered in everyday use of the metals, the Worcester Chapter course covers the fundamentals of shaping, treating, and behavior of metals and alloys. It is especially designed for the practical man. Classes began Monday, Oct. 16, continuing every Monday and Wednesday night for 12 weeks. Classes meet 7:15 to 9:00 p.m. in the lecture room in the Mechanical Engineering Building, Worcester Polytechnic Institute. Registration fee is \$15.00.

Powder Metallurgy Permits Working of Refractory Metals

By T. F. Mika

Chicago Chapter opened the 1939-40 season with an authoritative lecture by Dr. C. W. Balke, director of research at Fansteel Metallurgical Corp., on "The Powder Metallurgy of the Refractory Metals and their Carbides".

Metals like tantalum, columbium, tungsten, and molybdenum, because of their high melting points, would be unworkable if made by ordinary metallurgical methods. Compression of the powders, followed by sintering in a vacuum for tantalum and columbium and in a reducing gas, hydrogen, for tungsten and molybdenum, gives ingots of metal of sufficient ductility to allow cold and hot working.

Tantalum and columbium are comparatively rare, and are found principally in Australia and the Black Hills of Dakota.

To prepare the metals, the ore is crushed and ball milled and then fused with caustic soda in an iron pot.

The sodium-iron derivatives of tantalum and columbium formed by this fusion are leached in water, followed by hydrochloric acid, leaving a residue of "white mud". This white mud is dissolved in hydrofluoric acid, followed by an addition of potassium fluoride.

The double fluorides of tantalum and

columbium so formed are crystallized and the wide difference in their solubilities makes it possible to separate them.

The double fluoride of either tantalum or columbium is electrolyzed in an iron pot. Upon cooling, the particles of metal are freed from the remaining salts and dried. The powder is then pressed into bars in hydraulic presses, using pressures on the order of 1000 tons to cause sufficient cold welding for handling the bars.

The pressed bar is sintered in a high vacuum furnace in order to complete the welding of the particles. Because gases such as hydrogen or oxygen increase the hardness of the metal, the ingots must be sintered to vacuums as low as 1 or 2 microns.

Tantalum found its first commercial application in battery chargers and vacuum tubes. Although the metal is expensive, it is cheap from the standpoint of service, particularly as a heat transfer agent in corrosive acids.

The hard, brittle carbides of the refractory metals find their principal application as cutting tools.

The correct carbide to use is not dependent on its hardness, but rather becomes a problem of a specific tool for a specific job. Tantalum carbide is used to cut steel, but will not cut cast iron; tungsten carbide cuts cast iron, but will not cut steel.

The wearing away of a cutting tool is not caused by wear of carbides; it is merely the high heat (700 to 800° C.) of the cutting edge softening and washing away the cementing metal.

Woodside Raises Curtain on New Season Of Activity for Rhode Island Chapter

By Walter M. Saunders, Jr.

Rhode Island Chapter—Transporting his audience back through the years to the days when heat treating belonged to the blacksmith, A.S.M. President William P. Woodside, vice-president and director of research of the Climax Molybdenum Co., raised the curtain on another year of activity at the first meeting on Oct. 4.

From his priceless wealth of experi-

ence, he drew descriptions of conditions and practices existent at the beginning of technical interest in heat treating, and explained how several common treatments today were discovered by hard work and sometimes by accident.

Recalls Founding of Society

As an excellent illustration of the progress that has been made, Mr. Woodside showed the Climax Molybdenum film, "Panorama of Alloy Steels". In this region there are still several blacksmith shops that are duplicates of the one represented in the movie, where tempering is always done solely by color. Very likely in these shops the claim is still made—as it was 30 years ago—that failure of a steel axle is caused by "crystallization" of the metal.

Mr. Woodside's reminiscences of the founding of the Society and early activities of the members were of great interest, and the gradual change in attitude of the heat treaters to the "white collar" metallurgist was amusingly described.

Old coal-fired heat treating furnaces were illustrated by lantern slides and, of course, provoked many a smile from the younger members present, and to the older ones, recalled all sorts of memories, good, bad, and indifferent. Consensus of opinion, however, was that modern furnaces are better.

Of particular interest were slides made from cuts of coal-fired heat treating furnaces in an old catalogue of the local Brown & Sharpe Mfg. Co., who discontinued their manufacture many years ago.

"Born 30 Years Too Late"

Mr. Woodside's experiences have been so varied, as all who know him can testify, and his manner of describing them so modest and instructive, that many felt they had been born 30 years too late. Nevertheless, while it might seem that all the important changes in equipment and practices have been made, Mr. Woodside still left the impression that there are limitless possibilities in the future.

At the dinner preceding the meeting, "Lapse Time Moving Pictures of Flowers" were shown in a film made by Walter M. Saunders, Sr., of Providence, R. I., but a Boston Chapter member.

Employment Service Functions Smoothly Under New System

As announced in the October issue of THE REVIEW, the newly enlarged employment service for A.S.M. members has started to function. From Chicago, Cleveland, Baltimore, Columbus, Pittsburgh and other cities word comes from the association employment offices that contacts have already been made with chapter officials and arrangements are going forward so that all may become more familiar with the details of the plan.

Everywhere there is the desire to cooperate and make the service a worthwhile asset to the members of the Society.

It is quite evident to people conducting employment offices these days that companies are becoming more personnel conscious. They are realizing that the high cost of labor turnover can be greatly reduced by a more careful initial selection of men. The Government too is requiring detailed reports because of the social legislation that has been put on the statute books.

All of this is calling attention to the importance of having the right man in the right job and it is the purpose of this employment service that intelligent help be given to the members of the A.S.M. along this line.

The members can help very much in this program by reporting to the chairman of their chapter or to the local A.S.M. employment office in their community any openings or opportunities that come to their attention. It may be the very job that some A.S.M. applicant is well qualified to fill. The list of offices is shown below.

List of A.S.M. Employment Offices

AKRON, OHIO Merrill D. Wright Central Vocational Bureau 203 Buckeye Bldg.	DETROIT, MICHIGAN George M. Millar George M. Millar Employment Service National Bank Bldg.	OAKLAND, CALIFORNIA Harry B. Smith Pacific Audit & System Co. Inc. 1419 Broadway
ATLANTA, GEORGIA A. H. Benton Personnel Service Co. Mortgage Guaranty Bldg.	HARTFORD, CONNECTICUT Emory L. Wolfe Personnel Service Bureau, Inc. 720 Main Street	OMAHA, NEBRASKA Harry H. Knapp Western Reference & Bond Assn. 834 Redick Tower
BALTIMORE, MARYLAND H. C. Clodi Personnel Service Co. 1005 Lexington Bldg.	INDIANAPOLIS, INDIANA Ancil T. Brown Brown Efficiency Bureau 806 Guaranty Bldg.	PEORIA, ILLINOIS Harold S. Taes Taes Employment Agency 405 Main Street
BUFFALO, NEW YORK E. F. Dean Dean Employment Service Brisbane Bldg.	KANSAS CITY, MISSOURI T. DeWitt Hughes Western Employment Counselors Assn., Inc. 707 Sharp Bldg.	PHILADELPHIA, PA. J. D. Stephens Business Service Co. 1600 Walnut Street
CHICAGO, ILLINOIS Bert L. Parsons Consolidated Agencies, Inc. 209 South State Street	LOS ANGELES, CALIFORNIA Fred M. Smith Pacific Audit & System Co. Inc. 711 Story Bldg.	PITTSBURGH, PA. E. C. Coby Coby Service Bureau Bessemer Bldg.
CINCINNATI, OHIO E. A. Cost Progressive Placement Service 306 Schmidt Bldg.	MEMPHIS, TENNESSEE Shapiro Positions Exchange Union Planters Bank Bldg.	SAN ANTONIO, TEXAS George T. Ferris George T. Ferris Service 210 Gunter Office Bldg.
CLEVELAND, OHIO T. G. Protheroe A. R. Bradley Technical Placement Service 504 Swetland Bldg.	MILWAUKEE, WISCONSIN R. J. Willetts National Clerical Bureau 6069 Plankinton Bldg.	SAN FRANCISCO, CALIF. Harry B. Smith Pacific Audit & System Co. Inc. 57 Post Street
COLUMBUS, OHIO Harry C. Vaughn Harry C. Vaughn & Associates 36th Floor, A. I. U. Bldg.	MINNEAPOLIS, MINNESOTA W. A. Gilman James Ellis Service 929 Plymouth Bldg.	ST. LOUIS, MISSOURI E. T. Hasselbring Business Service Co. 16th Floor, Chemical Bldg.
DALLAS, TEXAS E. M. & Claude Karr Karr Employment Service Republic Bank Bldg.	NASHVILLE, TENNESSEE Murray E. Hill Murray E. Hill & Associates Third National Bank Bldg.	SYRACUSE, NEW YORK R. E. Taylor Taylor Employment 333 South Warren St.
DAYTON, OHIO Allen G. Banks Banks-Mitchell Employment Service 304 Keith Bldg.	NEW ORLEANS, LOUISIANA O. F. West Commercial Employment Agency 713 Canal Bank Bldg.	TOLEDO, OHIO E. Siefke Toledo Personal Service Co. 1125 Edison Bldg.
DENVER, COLORADO B. L. Johnson Business Men's Clearing House Midland Savings Bldg.	NEW YORK, NEW YORK Albert H. Rohrer Acorn Employment Service, Inc. 63 Park Row	WASHINGTON, D. C. A. C. Wright Boyd Employment Service 1333 F. Street, N. W.

MODERN STEELS

MANUFACTURE INSPECTION TREATMENT USES

The latest, most up-to-date information on the manufacture, inspection, treatment and uses of Modern Steels is contained in this new 350 page book. Written by the authorities shown below, the book contains 150 interesting illustrations covering the useful points brought out in the text.

Chapters cover raw materials and pig iron . . . steel making processes . . . steel pouring . . . hot working . . . inspection and testing . . . metallography . . . heat treatment . . . alloy steels . . . stainless steels . . . and toolsteels.

AUTHORS

M. W. Lightner, Chief Metallurgist, Homestead Works, Carnegie-Illinois Steel Corp.
G. R. Fitterer, Professor of Metallurgy, University of Pittsburgh
Ernest E. Thum, Editor, Metal Progress
Franklin H. Allison, Jr., Chief Metallurgist, United Engineering & Foundry Co.
A. W. Demmler, Metallurgist, Vanadium Corporation of America
J. P. Gill, Chief Metallurgist, Vanadium-Alloys Steel Co.

Use the coupon below to order your copy today.
MODERN STEELS—350 pages—150 illustrations—
6x9—red cloth binding \$3.50

American Society for Metals
7016 Euclid Avenue
Cleveland, Ohio

Gentlemen: Please send me a copy of your new book, MODERN STEELS. I am enclosing \$3.50 in cash (), money order (), check ().

NAME

ADDRESS

CITY.....STATE.....

Plastics Rated Tenth Industry In the U. S.

Talk on Modern Plastics Preceded by Plant Visit to American Steel and Wire Co.

By G. J. Hales

Cleveland Chapter opened its activities for the new season with an afternoon inspection trip to The American Steel & Wire Co.'s Cuyahoga Works on Oct. 2. Small groups were personally conducted through the hot mills, the cold rolling mill and the wire mill.

More than \$4,000,000 has been spent in rehabilitating and modernizing this plant in the last year and a half, and it contains the largest cold rolling strip mill in the world. Most interesting also was the continuous McKay process type pickle capable of taking strip up to 36 in. wide, with all handling facilities mechanized.

Protective atmosphere, bell-type furnaces, with unusually close temperature control and distribution, were witnessed in operation, as well as a modern continuous strip shearing machine.

After the inspection tour the Chapter reassembled at the Cleveland Club for a dinner meeting, at which W. B. Hoey of the Bakelite Corp. discussed modern plastics.

The plastics industry is now rated as the tenth business in the United States. Internationally the United States ranks foremost in the plastics industry, with England, Germany and Japan following in sequence.

Plastics Are of Two Types

Basically, plastics are of two types—thermosetting and thermoplastic. As the names indicate, the first group is formed under heat and pressure, and during this formation undergoes a chemical change which permanently sets it, whereas the thermoplastic group can be set up under pressure and if subsequently exposed to heat, will deform and in many cases can be reformed to the original or different shapes. There are many different compositions of each type of plastic designed for different applications.

Improvements are continually being made so that today the common telephone has been designed for an expected life of 15 years during which it will retain its original color. Incidentally, the telephone has been designed to withstand the many shocks encountered during its life including frequent use as a hammer (not recommended).

Plastics Encroach in Metals Field

The plastics industry requires high grade polished steel molds, and a coming application is steel inserts in molded parts. Although the plastics industry is giving the steel industry some business, at the same time it is encroaching in many fields formerly considered solely metallurgical.

Experimentally, airplane fuselages have been molded, offering materially less wind resistance with consequent higher speeds and heavier loads. Experimental automobile bodies offer the advantage of less than 60% the weight of a body fabricated from steel.

The relatively new art of plastics has steadily encroached upon the fields of metal applications, and with threats of future all-plastic automobiles and aircraft the question of competition becomes of concern to all metallurgists.

Mr. Hoey's wide experience in research and engineering work on plastics makes him eminently qualified to discuss the various types of modern plastics, their advantages and limitations and methods of processing.

Glimpses of the National Metal Congress



Only a Small Part of the Many Exhibits in the National Metal Exposition Held in Chicago Oct. 23 to 27 Can Be Seen in This View of the Arena in the International Amphitheatre. Two large wings were also completely filled.

Tool Steel Selection Is Associated With Tool and Die Life

By J. W. McBean

Ontario Chapter held its first meeting in the Niagara Peninsula, gathering on Oct. 6 at the Welland House in St. Catharines.

The speaker was H. B. Chambers, metallurgist for the Atlas Steels Limited of Welland, who took as his subject "Some Fundamental Ideas Concerning the Application and Heat Treatment of Tool Steels".

He showed how the selection of tool steels and their subsequent heat treatment are associated with tool and die life, giving information enabling the user better to diagnose his own tool steel problems.

Some of the difficulties which the user encounters may be grouped as follows:

1. Tools wear out too soon in service.
2. Tools chip or break in service.
3. They change size in hardening.
4. They warp or crack in hardening.

In order to get the best results it is necessary to know the relative properties of the various tool steels, the effect of various heat treatments, and to combine these with a "mechanical sense" which is necessary to evaluate the service requirements.

By means of typical applications and photomicrographs the relative wear resistance and toughness of the various carbon tool steels were evaluated. Their shortcomings in relation to the demands of production were then pointed out and from these considerations all tool steels were classified into twelve groups, as follows:

Class 1. Movement in hardening unimportant—groups 1, 2, 3, 4.

Class 2. Movement in hardening important—groups 5, 6, 7, 8.

Class 3. Resistance to high temperatures important—groups 9, 10, 11, 12.

In each class the first group has high wear resistance and poor toughness, with progressively decreasing wear resistance and increasing toughness in each subsequent group in the class.

A composite chemical analysis of the various steels in each group indicated the distinguishing elements common to the individual steels. The type analysis of the steel in each group that covers the widest field of application was also given.

The latter part of the talk was devoted to hardening technique.

Some ideas on the relation of tool design to success or failure in hardening were included, and the whole theme of the talk was based on helping the tool maker diagnose his own tool problems.



R. E. Desvernine, President of Crucible Steel Co., Seated Next to A.S.M. President Woodside, Was the Featured Speaker at the A.S.M. Annual Banquet

WANTED

A complete file of METAL PROGRESS since its first number (September 1930), bound or unbound.

Address Box 10-1
American Society for Metals
7016 Euclid Ave. Cleveland, O.

How would war affect us through mineral shortage?

With lack of strategic materials leading to war, and with war making the lack more pronounced, we become enmeshed in a vicious cycle that has furnished ample reason for the increased interest in the subject of strategic mineral supplies in the U.S. as well as other countries. Now, for the first time, the important subject is authoritatively discussed—

STRATEGIC MINERAL SUPPLIES

By G. A. Roush

Major, Staff Specialist Reserve, U. S. Army

\$5.00

This book presents a general survey of the more important strategic mineral commodities—those of which the domestic output is inadequate to meet the demand, forcing extensive dependence on imports from foreign sources.

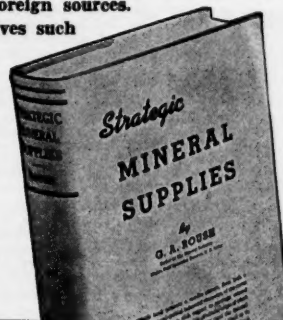
Of the twelve commodities discussed, the book gives such basic items as uses, substitutes, ore reserves, source of supply (both foreign and domestic), imports, exports, stocks, tariff, and political and commercial control, as they affect the domestic situation.

Order your copy from

The American Society for Metals

7016 Euclid Ave.

Cleveland, Ohio



Aborn Analyzes Metallurgy of Steel Welding

Control of Cooling Rate Is Vital to Quality of Welds in Steel; Other Factors Also Discussed

By Fred P. Peters

New Jersey Chapter is currently overrun with steel welding experts, thanks to the unusually clear analysis of the metallurgical aspects of ferrous welding presented at the season's first meeting on Sept. 18th by Dr. R. H. Aborn, metallurgist, United States Steel Corp. Research Laboratory.

Confining his discussion largely to non-pressure (or more popularly, "fusion") welding, the speaker outlined the fundamental phenomena involved, then translated them into practical terms that could be applied to the control of weld quality. The translating process was infinitely aided, incidentally, by the use of "S-curves" to depict the time-temperature relations in the transformations in solid steel.

Welding comprises two fundamental metallurgical processes: The melting and freezing of the weld metal; and the heating and cooling of the heat-affected zone—the solid metal in and near the weld.

Overcoming Oxidation and Nitridation

Generally speaking, the melting and freezing of the weld metal are closely related to the same processes in making castings or ingots—oxidation and nitridation must be avoided, and dendritic (cast) structures can be expected in welds that are not subsequently heat treated, either intentionally or through successive multilayer passes.

Smart welders today overcome oxidation and nitridation difficulties by some form of "shielding"—in arc welding by using a short arc and specially coated electrodes, and in oxy-acetylene welding by employing a slightly carburizing flame.

One of the most common causes of poor quality welds is the use of uncoated electrodes and too-long arcs in arc welding. Such bare-arc welding can definitely be blamed for poor welds

Past Chairmen of York Chapter at Picnic



Past Chairmen of the York Chapter at the Annual Picnic Are (Left to Right) William F. Allen, Frank J. Allen, John C. Bennett, A. Floyd Whalen, Norman J. Gebert, and James G. Morrison. Missing in the photograph are George J. O'Neill, first chairman, and Arthur W. F. Green, second.

Preparedness Talk, Movie, Exhibit and Yearbook Regale Philadelphia Members

By Joseph Missimer

Philadelphia Chapter — The new chairman, W. Elmer Titus, was given an enthusiastic send-off at the first meeting held on Sept. 29, at Temple University.

An audience of 660 members and visitors was well repaid with a complete and timely program, including the speaker of the evening, Brigadier General C. T. Harris, Jr.; the film "Panorama of Alloy Steels", by the courtesy of Climax Molybdenum Co.; an educational, scientific and industrial exhibit; and the 1939 edition of the Philadelphia Chapter Yearbook.

Guests for the evening included the men enrolled in the Chapter-sponsored course in physical metallurgy. Joseph G. Jackson, chairman of the Educational Committee, outlined the purposes and the subject matter of the course and emphasized the importance of the well equipped laboratory at Temple University as a supplement to the lectures.

He then introduced Horace C. Knerr, director of the course, under whose tutelage during the past 18 or 19 years many hundreds of students have received instruction. He will have well over 100 enrolled in the course during the coming year.

Charles E. Metzger, director, Extramural Division, Temple University, presented Certificates of Proficiency in

if investigation shows them to contain oxides and nitrides, and to have low ductility and fatigue values.

Somewhat more difficult of control are the microstructural changes, dimensional distortion and lock-up stresses associated with the heating and cooling of the heat-affected zone.

Internal Stress Is Problem

Distortion of welded structures reaches sizable proportions in large assemblies free to expand and contract; when expansion and contraction are hindered by rigid fastening of the assembly, harmful internal stresses may be set up that must be dissipated by subsequent annealing at 1100 to 1200° F. (for carbon steels). The amount of internal stress seems to bear some relation to the yield strength of the steel, and is therefore a greater problem in low alloy steels than in plain carbon steels of lower yield strength.

The basic concept of steel weldability, however, rests on the structural changes that occur in the heat-affected region. In this region, between the weld metal and the unaffected parent metal, are three easily distinguishable structural zones—the zone, next to the weld, of overheated, coarse-grained metal; an intermediate zone showing considerable grain refinement; and, next to the unaffected parent metal, the transformation zone.

Weldability of steels is really the antithesis of hardenability, for brittleness and joint-weakness result from the development of a martensitic struc-

Physical Metallurgy to the advanced class of 1939.

The appropriateness of the topic selected by Brigadier General C. T. Harris, Jr., assistant to chief of ordnance, U. S. Army, "Metallurgy and Preparedness", speaks for itself, and gave a clear picture of what will be expected of the metals industries should the United States become involved in war.

The General told of the influence of metallurgy in improving ordnance cannon and material from the old cast iron gun up to the modern alloyed metal gun. Improvements in gun mounts by welding have materially strengthened and lightened the equipment.

The discussion also explained the metallurgical set-up in the Ordnance Department, centering around the Watertown Metallurgical Laboratory, and including the Metallurgical Advisory Board composed of representatives of industry. The speaker outlined the necessary minerals, in which this country is deficient, and emphasized the legislative status of the present Ordnance Preparedness Program in placing "educational orders" and providing for adequate stock-pile reserves.

Concluding his address, Brigadier General Harris expressed his conviction that "adequate preparedness is our surest guarantee of peace".

The excellent film "Panorama of Alloy Steels" provided the grand finale.

ture, particularly in the coarse-grained zone immediately adjacent to the weld.

The structure obtained at any point depends on steel composition, the maximum temperature attained, and the cooling rate. A cooling rate slow enough to cause the steel to transform to pearlite rather than martensite is essential, if hard, brittle, internally stressed areas, possibly containing microscopic "quenching cracks", are not to be present. For even though stress relief annealing or subsequent passes in multilayer welding may temper the martensite, they cannot eliminate the cracks that are formed nor heal the fissures near the fusion line.

Assuring Slow Cooling

Slowest cooling rates are obtained with the thinnest possible sections to be welded, with the highest possible welding heat input and with the highest possible initial temperature of parent metal. The heat-affected zone will transform largely to pearlite if carbon and alloy contents are relatively low, if the thickness of the section is not so great as to provide strong heat-extractive or quenching action, and if the parent metal temperature or heat input is high enough to act as a drag on whatever quenching effect the mass of parent metal does offer.

Given a certain and possibly not entirely desirable combination of composition and thickness, one of the most successful ways of assuring sufficiently slow cooling is to preheat the joint area between 200 and 600° F.

Cincinnati Has Get-Together At Yacht Club

Five Reels of Movies Replace Technical Lecture

By K. Siems

Cincinnati Chapter has formed the habit of opening each season with a "general get-together" for its September meeting. These meetings have been held in places other than the regular headquarters of the Chapter for two reasons:

First, to renew old acquaintances and make new contacts and get the various fish-stories and other experiences of the vacation season out of our systems.

Second, because old man summer is still in complete control of the situation in this part of the country. He was particularly tenacious this year when he kept the temperature hovering around 100° for a week or more.

Received with considerable delight, therefore, was the news that the new officers of the Chapter had selected the Cincinnati Yacht Club "on the Ohio River" for the meeting place. Welcome relief from hot city streets was obtained on the fore and aft decks of the club.

Diverting a River Shown

The meeting functioned smoothly in accordance with a pre-arranged schedule, but one familiar face was missing—that of Secretary George H. Gerdes. George had been laid up at his home for over two weeks with an infection.

No technical lecture had been arranged for this meeting; instead, five reels of motion pictures by the Aluminum Co. of America were run off.

The first reel entitled "Tipping Obelisk" showed the diverting of the Saguenay River in Canada by means of a concrete obelisk built on the edge of the river and with its underside conforming in shape to the bottom of the river so that when it was dynamited off its supporting base and tipped over in the manner of a draw-bridge, its underside properly fitted into the irregularities of the bottom of the river and its top side was level to permit building the upper structure of the dam.

It was a scenic film and its high-light was the dynamiting and tipping of this obelisk, repeated in slow motion—a very commendable picture.

Aluminum Manufacture Intricate

The remaining four reels, entitled "Mine to Metal", were by their nature perhaps even more interesting from an expert point of view. They illustrated a complete history of aluminum and gave to many for the first time a full realization of the intricacies of its process of manufacture and the ingenious equipment developed to make it possible for us to buy this metal today so cheaply in comparison with its first market price of several hundred dollars per pound.

At the conclusion of the meeting, the new chairman, J. B. Caine, reminded all those present that beginning with the October meeting, and for the remainder of the season, "serious business" would be the theme.

He had, of course, reference to the technical part of the meetings only, because hospitality is traditional with the Cincinnati Chapter. Strangers, guests and friends are always made to feel welcome.

The Cincinnati Chapter is proud of being considered one of the most wide-awake organizations amongst local engineering and technical societies. Something worth while is always to be heard and seen at any one of its regular or discussion group meetings.

HELP WANTED

Address answers care of A. S. M., 7016 Euclid Ave., Cleveland, unless otherwise stated.

PHYSICAL METALLURGIST: 25 to 30 years old, for small company manufacturing metal carbides for cutting tools. Must know something of machine shop practice, have good training and some plant experience. Excellent prospects for advancement. Box 10-15.

METALLURGIST: For small foundry operated by aircraft manufacturing company in China. Small factory, new, far from war zone, under American management. New houses and quarters provided. Single man about 30 preferred but not essential. Box 10-5.

YOUNG TECHNICAL GRADUATES: To train for positions as field service engineers for manufacturer of electric pyrometers and automatic control equipment. Requirements include outstanding personality, highest character references, engineering education, plus background of industrial plant earning experience. Excellent opportunities for promotion after substantial period of thorough training. Write stating age, education, experience and salary desired. Box 10-10.

RECENT GRADUATE: For industrial fellowship on fractional vacuum fusion and subsequent employment by large steel company in similar lines. Send statement of qualifications to Battelle Memorial Institute, Columbus, Ohio.

SALESMEN: Acquainted with gray iron and non-ferrous foundry trade. To talk to gray iron foundrymen and introduce a superior patented material which meets their needs. U. S. and Canada territories open. Auto needed. Write for details and assignment; give brief history of experience and qualifications. Box 10-20.

FOUNDRY METALLURGIST: Should have some practical gray iron foundry experience combined with good basic metallurgical knowledge. Laboratory and testing experience desirable. Position involves both sales service work and creative and original research. Age 27 to 35. Excellent opportunity. Box 10-25.

HERE AND THERE WITH A.S.M. MEMBERS

A.S.M. Medalists Honored at Banquet

In recognition of his pioneering metallurgical achievements which have stimulated organized work along similar lines to such an extent that a marked basic advance has been made in metallurgical knowledge" the Albert Sauveur Achievement Award of the American Society for Metals was presented to STANLEY P. ROCKWELL at the Annual Banquet of the A.S.M. on Thursday, Oct. 26 during the National Metal Congress in Chicago.

Rockwell's most famed "pioneering metallurgical achievement" is the Rockwell hardness tester.

It was five years after his graduation from Yale's Sheffield Scientific School as an electrical engineer that "Stan" joined the New Departure Mfg. Co. as testing engineer and metallurgist and was given the job of supervising the hardening of ball races. How the need for an accurate instrument for measuring hardness led to the development of the Rockwell tester is told in detail in the November issue of METAL PROGRESS which carries an extended biography of Mr. Rockwell.

He left New Departure in 1916 to become consulting metallurgist for E. F. Houghton & Co., joined the Ordnance Department during the War, and was subsequently metallurgist for Weeks-Hoffman Co. and Whitney Mfg. Co. In 1923 he established his own consulting and engineering service together with a commercial heat treating shop known as the Stanley P. Rockwell Co., with which he is still actively associated as vice-president and general manager.

A more recent achievement in which Rockwell takes equal pride to the testing machine is his dilatometer, in the building and operation of which he spent more years than in the development of the Rockwell hardness tester, and which he feels will stimulate metallurgical knowledge and advancement to an equal degree.

AMONG the honors conferred at the Annual Banquet of the American Society for Metals on Thursday, Oct. 26 during the National Metal Congress in Chicago was the Henry Marion Howe Medal awarded annually to the author or authors of the best paper to appear in the Society's TRANSACTIONS during the preceding year.

To receive the 1939 medal a committee appointed by President Woodside selected CHARLES S. BARRETT, GERHARD ANSEL and ROBERT F. MEHL, whose paper on "Slip, Twinning and Cleavage in Iron and Silicon Ferrite" appeared in the September 1937 issue of the TRANSACTIONS.

Research for this paper was conducted under the direction of Dr. Mehl at the Metals Research Laboratory of Carnegie Institute of Technology.

Charles S. Barrett has been on the staff of the laboratory and a lecturer in Carnegie Tech's department of metallurgy since 1932. Born in Vermilion, S. D. in 1902, he received his B.S. from University of South Dakota in 1925 and his Ph.D. from the physics department of University of Chicago in 1928. He spent the years from 1928 to 1931 in the division of physical metallurgy, Naval Research Laboratory.

Gerhard Ansel, who is only 27 years old, was born in Germany. He received his B.S. in metallurgy from M.I.T. in 1934 and his M.S. from Carnegie Tech in 1935. He remained there as a research assistant in the Metals Research Laboratory until 1937, when he took a position on the metallurgical staff of Dow Chemical Co., Midland, Mich.

Robert F. Mehl has been director of the Metals Research Laboratory since 1932 and head of the department of



S. P. Rockwell



C. S. Barrett



G. Ansel



R. F. Mehl

metallurgy at Carnegie Institute of Technology since 1935. He received his B.S. from Franklin and Marshall College in 1919 and his Ph.D. from Princeton in 1924, where he held the Proctor Fellowship in chemistry.

From 1923 to 1924 he was head of the department of chemistry of Juniata College, and for the next two years was National Research Fellow at Harvard. He then became superintendent of the division of physical metallurgy at the Naval Research Laboratory in Washington until 1931, when he spent a year as assistant director of the research laboratories at American Rolling Mill Co. before coming to Carnegie Tech.

He was awarded the honorary degree of Doctor of Science from Franklin and Marshall College in June 1938.

CONNECTED with the Continental Steel Corp. for 32 years, RALPH K. CLIFFORD, formerly works manager of the Kokomo Division, has now been named vice-president in charge of operations for all of the company's plants, at Kokomo, Indianapolis, and Canton.

Mr. Clifford began his career in the steel industry in 1907 with the Kokomo Steel & Wire Co., which, in 1927, became a part of the Continental Steel Corp. From 1907 until his graduation from the University of Michigan in 1914, Mr. Clifford worked in various

departments of the Kokomo plant during school vacation periods.

After two years spent teaching chemistry and physics in Michigan high schools, Mr. Clifford became chief chemist of the Kokomo plant, later assuming the duties of chief metallurgist and chief inspector.

He was appointed assistant general superintendent of the Kokomo plant in 1923, and two years later was elevated to general superintendent. He became works manager of the Kokomo division in 1937.

Mr. Clifford is a past president of the Wire Association, a member of the executive committee of the Open Hearth Committee of the American Institute of Mining and Metallurgical Engineers, and a member of the Indianapolis Chapter of the A.S.M.

AN electrical engineer turned metallurgist, R. CARSON DALZELL has been appointed technical advisor to the Baltimore Division of Revere Copper and Brass, Inc.

With his electrical engineering degree from Johns Hopkins in 1927, Mr. Dalzell entered the Graduate Engineering School of Harvard University, received the degree of Master of Science in non-ferrous metallurgy in 1928, and the degree of Doctor of Science in metallurgy in 1929.

He then joined the central research

laboratory of the American Smelting and Refining Co. at Perth Amboy, N. J., where he remained until 1931.

In 1931 he was engaged by G. H. Clamer of the Ajax Metal Co. for a period of one year on process development. Upon completion of his work there, he engaged in general metallurgical consulting work.

From 1933 to 1937 Dalzell was employed by the American Oil Co., Baltimore, resigning to come with Revere in 1937.

J. C. JOUBLANC, for the past three years chief metallurgist for Harnischfeger Corp., Milwaukee, is now director of metallurgy and research for R. G. LeTourneau, Inc., Peoria, Ill. "Jay" was with the metallurgical department of Republic Steel Corp. for ten years and Lincoln Electric Co. four years, before joining Harnischfeger.

PAST CHAIRMAN S. K. OLIVER of the Dayton Chapter is now with the Douglas Aircraft Co. in Santa Monica, Calif. Oliver has been with the Electro-Motive Corp., La Grange, Ill. for the past year and a half, and before that was metallurgist for Delco Products Corp. of Dayton, Ohio.

VICTOR O. ALLEN, for the past five years associated with the Radio Corp. as consulting and research engineer, has now been named technical director of the Wilbur B. Driver Co., Newark, N. J.

Educated at King Edward VI School in England, F. & M. Academy and F. & M. College, he has had broad experience in development and research.

Starting with Carnegie Steel Co. of Pittsburgh during his college vacation, Mr. Allen was subsequently connected with Union Carbide and Westinghouse. In 1932 he was assistant chief engineer with De Forest-Radio until absorbed by R.C.A., and from that date to 1934 was in charge of power tube development and research for Hygrade Sylvania Corp.

ALL of the stock of Buffalo Testing Laboratories, Inc., Buffalo, has been acquired by JOHN H. BIRDSONG and ALBERT H. HALL, who will continue without change their business of general analytical and consulting chemists.

Mr. Hall has been elected president and John Birdsong vice-president, secretary and treasurer of the Testing Laboratories. John is one of the mainstays of the Buffalo Chapter. He has served in almost all of the Chapter offices, and is now secretary.

DIED

HENDERSON H. MINOR, recently retired president of the Steel Supply Co., died on Sept. 16, after a four-week illness at St. Luke's Hospital, Chicago. Mr. Minor was born in 1859 in Nashville, Tenn., and was associated for many years in the steel industry, commencing as a young man with the Crescent Steel Co. He was a member of the Chicago Chapter, A.S.M.

CHARLES M. SCHWAB, chairman of the board of Bethlehem Steel Corp., who died in September, was an honorary member of the A.S.M.

CHARLES TRUEG, secretary and treasurer, Pittsburgh Instrument and Machine Co., Pittsburgh, died Nov. 8.

Made Honorary and Founder Members

EARLY in 1920 a committee composed of members of the American Steel Treating Society and the Steel Treating Research Society

announced amalgamation of the two organizations to form the American Society for Steel Treating, later changed in name to the American Society for Metals.

One member of that committee was not affiliated with either group, yet was largely responsible for the amalgamation and the formation of a strong and united organization. He was ALBERT E. WHITE, later elected first president of the new organization to serve well and faithfully during the trying first year.

Last month at the Annual Banquet of the American Society for Metals Dr. White was named a founder member of the Society.

A noted educator, Dr. White has taught at University of Michigan since 1911 and has for many years been director of that school's famed and progressive Department of Engineering Research.

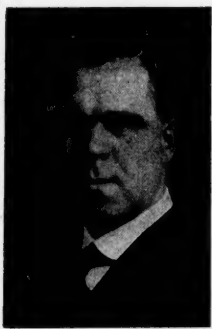
ELECTION to honorary membership is a signal honor conferred but rarely by the American Society for Metals.

Only 14 such members have been named during the life of the Society and 10 of them are no longer living.

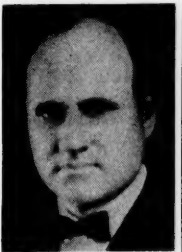
Added to this list of distinguished names at the Annual Banquet of the Society on Oct. 26 was that of ZAY JEFFRIES, consultant, Incandescent Lamp Department, General Electric Co., Cleveland, and chairman of the Carbonyl Co.

Well known for his development of the slip interference theory of steel hardening, his work on cemented tungsten carbide and on aluminum, Dr. Jeffries has received many honors, including the Albert Sauveur Achievement Award of the A.S.M. and, more recently, election to the National Academy of Sciences.

Dr. Jeffries has given freely of his time and services to the Society, not only as national president, national treasurer, chairman of the Finance Committee, member of the METAL PROGRESS Advisory Board, but also by contributing valuable advice and sound judgment on occasions when he did not occupy an office.



A. E. White



Zay Jeffries

Helpful Literature — Mail Coupon Below

Spectrometry

A chapter on basic theory and design of spectrometers or spectrographs explaining the principle of operation in full detail precedes a catalog of spectrometric equipment by Bausch & Lomb Optical Co. Bulletin Fa-35.

X-Ray Examination

The application of X-ray examination and inspection of castings, welding, and food products, as well as practical X-ray crystal analysis, is completely described and strikingly illustrated in General Electric X-Ray Corp.'s 34-page publication. Bulletin Dy-6.

Testing Catalog

A loose-leaf binder provides a handy reference catalog of testing machines made by Steel City Testing Laboratory. Universal hydraulic machines, Brinell testers, bend, impact, tensile, and ductility testers are some of the products. Bulletin Oy-140.

Bright Annealing

Various types of electric and fuel-fired furnaces built by the Electric Furnace Co. for bright-annealing wire, tubing, strip and other products are described in an 8-page folder. Bulletin Lb-30.

Burner Economy

Interesting photographs and text are used by Surface Combustion Corp. to show that a choice of 47 different types and more than 400 different sizes is sure to give economy in operation. Bulletin Ca-51.

Cinch Steel Cement

How Cinch steel cement saves high speed steel and Stellite by permitting the using up of short pieces is told in a bulletin by Claud S. Gordon Co. Bulletin Ka-53.

Chapmanizing

Chapmanizing, the method of surface hardening steel with nitrogen, is described in a very attractive booklet of Chapman Valve Mfg. Co. Information is given on the method itself and on its metallurgical advantages. Bulletin Ob-80.

Tool Steels

Matched tool steels are explained in a brand new 60-page manual just made available by the Carpenter Steel Co. Interesting savings explained. Bulletin Lc-12.

Welding Pipe Lines

An improved welding method used in the construction of over 5000 miles of cross-country pipe lines is discussed in a 32-page illustrated booklet published by The Linde Air Products Co. Bulletin Da-63.

High Tensile

The 19 advantages that USS Cor-Ten steel offers to railroads and other industries are attractively presented in a 68-page book on this new low cost, high tensile steel published by United States Steel Corp. Bulletin Ka-79.

Brazing Alloy

Sil-Fos for joining brass, bronze, nickel, nickel silver, extruding brass and bronze, monel metal and other non-ferrous metals and alloys fusing above 1300° F. is a product of Handy & Harman, described in Bulletin Jy-126.

Screw Machining

Screw machine products of aluminum are treated in authoritative and extensive manner in a booklet of Aluminum Co. of America. Besides general data on screw machining, a number of very useful tables appear. Bulletin Ar-54.

Electromet Review

A very attractive house organ which gives news and views of alloy steels and irons, but is mostly concerned with stainless steels. Electro Metallurgical Co. publishes it. Bulletin Ox-16.

Thermometers

A new line of thermometers and pressure gauges is announced in a colorful 8-page booklet by the Brown Instrument Co. Bulletin Lc-3.

Carburizing Retorts

Low cost, flexibility, uniformity, control, quality, and less labor with retort gas carburizing, says American Gas Furnace Co. Rotary, vertical and bell type retorts are described in Bulletin Jy-11.

Homo Furnaces

The complete line of modern Homo furnaces is shown in a profusely-pictured 36-page catalog issued by Leeds & Northrup Co. Shows many varieties of work now being tempered, annealed or normalized in modern Homo furnaces. Bulletin Fb-46.

Galvanizing

An informative, historical, simple digest of galvanizing forms a guide to longer life for iron and steel products. This handsome, handy, 24-page book beautifully printed in color is distributed by American Hot Dip Galvanizers Association, Inc. Bulletin Ea-167.

Welding Stainless

How to weld stainless steels is described in a colorful 12-page folder released by the Page Steel and Wire Division of American Chain & Cable Co., Inc. Bulletin Cc-86.

Ingot Production

"The Ingot Phase of Steel Production" is the title of a book defining the principles of quality ingot production followed by many well-known steel manufacturers. Gathmann Engineering Co. Bulletin Ka-13.

Lectrodryer

A machine designed specifically for the dehumidification of air and other gases as well as certain liquids—the "Lectrodryer"—is pictured and explained in a booklet by the Pittsburgh Lectrodryer Corp. Bulletin Gc-187.

Heat Resisting Alloys

Authoritative information on alloy castings, especially the chromium-nickel and straight chromium alloys manufactured by General Alloys Co. to resist corrosion and high temperatures, is contained in Bulletin D-17.

Electric Furnaces

A new catalog on electric furnaces and pyrometers has been released by the Hoskins Manufacturing Company. For anyone who does any kind of heat-treating, brazing, or uses heat-resisting castings. Bulletin Hc-24.

Hardened Gearing

Extremely valuable technical information on heat treated hardened gearing, including treatment, control and quenching, comparison of properties, etc., is included in a booklet by the Westinghouse Electric & Mfg. Co. Bulletin Hc-134.

Pure Metals

Pure, carbide-free metals are described and applications suggested in a pamphlet published by Metal & Thermit Corp., who make pure tungsten, chromium and manganese in addition to the ferro-alloys. Bulletin Ma-64.

Heat Treat Chart

Heat treaters everywhere should find a heat treating wall chart complete with S.A.E. specifications a very valuable addition to their shops. Published by Chicago Flexible Shaft Co., manufacturers of Stewart industrial furnaces. Bulletin Ka-49.

Heroult Furnace

Revised and expanded to include modern major innovations in the construction and operation of the Heroult electric furnace, the latest edition of the American Bridge Co.'s Heroult Electric Furnace Bulletin is available. Bulletin Bb-124.

Moly Matrix

Climax Molybdenum Co.'s little monthly newspaper contains many interesting and informative articles. Get the latest issue—Bulletin Ax-4.

Seamless Tubes

Prepared by the Timken Steel and Tube Division of Timken Roller Bearing Co. is a "Guide for Users of High Temperature Steels," which presents technical data relating to the various properties of Timken seamless tubes. Bulletin Bb-71.

Mo-W High Speed

J. V. Emmons, metallurgist for Cleveland Twist Drill Co. and largely responsible for the development of the molybdenum-tungsten high speed steels known as Mo-Max, has prepared a general description of these new steels. Bulletin Ka-103.

NI-Cr Castings

Compositions, properties, and uses of the high nickel-chromium castings made by The Electro Alloys Co. for heat, corrosion and abrasion resistance are concisely stated in a handy illustrated booklet. Bulletin Fx-32.

Cadalyte "39"

A new technical service manual on CADA-LYTE "39" for cadmium plating has been issued by the Electroplating Division of Du Pont. Cites recent improvements and changes in the product, and gives detailed operating instructions and methods of analyses. A table of costs and time required for specified deposits is included. Bulletin Gb-29.

Tellurium Coppers

A comparison of Chase Tellurium Coppers with other alloys is contained in a new folder published by the Chase Brass & Copper Co. Bulletin Kc-59.

Annual Index

The Annual Index of the Copper Alloy Bulletin published regularly by the Bridgeport Brass Company is now made available through this company. Bulletin Kc-163.

Steel Stock List

Ryerson "Certified" Steels are listed in an attractive stock list just made available by Joseph T. Ryerson & Son, Inc. Bulletin Kc-106.

Low-Alloy Steel

A new folder on Mayari R. Bethlehem's high-strength, corrosion resisting steel, is colorfully illustrated with views of its various uses. Bulletin Kc-76.

Gas Carburizing

"Three methods of gas carburizing," a reprint of an article by W. A. Darrah, Pres., Continental Industrial Engineers, Inc., is available for those interested in this subject. Bulletin Kc-154.

Hardness Testing

A 4-page folder which has as its purpose "to give you an idea of how practical a thing it is to make hardness tests on raw stock or fabricated metal parts in all plants where metal is worked, and to suggest something of the necessity for making such tests, or at least their importance" is available through the Wilson Mechanical Instrument Co., Inc. Bulletin Fb-22.

Lubrication

Intensive research which completed important improvements in the field of heavy-duty gear and bearing lubrication is tabulated in a new 12-page illustrated bulletin just released by D. A. Stuart Oil Co., Ltd. Bulletin Lb-118.

Defi Rust

Analysis and descriptive notes of nine types of heat and corrosion resisting steels made by Rustless Iron and Steel Co. are contained in a handsome folder. Bulletin Ha-169.

Carburizing Salt

A technical service bulletin describing a new development—DuPont Carburizing Salt—for the economical production of deep high-carbon cases on plain carbon and alloy carburizing steels . . . available through DuPont. Bulletin Dc-29.

Stainless Data Book

All users of stainless and heat resisting alloys should find invaluable the information contained in a booklet published by Maurath, Inc., giving complete analyses of the alloys produced by the different manufacturers, along with the proper electrodes for welding each of them. Bulletin Jy-125.

Portable Hardness Tester

The "Telebrineller" is described in a new bulletin as a simple, rugged, flexible instrument that accurately determines Brinell hardness of surfaces and objects inaccessible to conventional testers. Total weight, 6½ lbs. Teleweld, Inc. Bulletin Dc-98.

Colmonoy

The high resistance to wear and corrosion which distinguishes Colmonoy alloys and overlay metals is explained in a 4-page catalog released by Wall-Colmonoy Corp. Bulletin Bc-85.

Oil Burners

North American Mfg. Co. offers a bulletin describing improved low pressure oil burners, one type especially designed for automatic control and ideally suited for use with proportioning control valves. Bulletin Na-138.

Hydrazing

Hydrazing work is completely described in recent literature released by Lindberg Engineering Co. Points out advantages in particular applications. Bulletin Bc-66.

Dust Control

Dust control in the plant is as important as dust control on the prairies. American Foundry Equipment Co. points out in a booklet describing their "Dustube" dust collectors. Bulletin Id-112.

Bessemer Steel

Jones & Laughlin Steel Corp. has for distribution reprints of the paper by C. C. Henning on "Manufacture and Properties of Bessemer Steel" that received the Robert W. Hunt Award of the A.I.M.E. Bulletin Ca-50.

Global Elements

Global Pin Type Non-Metallic Electric Heating Elements and Terminal Rods and Global "AT" Type Non-Metallic Electric Heating Elements are explained and illustrated in two recent booklets issued by the Global Division of the Carborundum Company. Bulletin Lb-25.

Cutting Oils

An interesting new booklet "Metal Cutting Lubrication—In Theory and Practice" has just been made available by Cities Service Oil Co. Bulletin Ec-113.

Direct Reading Brinell

Production testing on parts of any shape without spotting or the use of a microscope is possible through the new Direct Reading Brinell machine described in a folder by the Detroit Testing Machine Co. Bulletin Gc-245.

Wide-Strip Pyrometer

Complete information on the new Bristol Multiple Record Wide-Strip Pyrometer can be obtained through the Bristol Company. Gives up to 8 temperature records on the same chart. Bulletin Ac-87.

Cr-Ni-Mo Steels

A Finkl & Sons' new catalog is really a technical treatise on chromium-nickel-molybdenum steels for forgings. Pocket size, 104 pages, cloth bound, illustrated by photographs, charts and tables. Bulletin La-23.

Heat Treating Furnaces

A brand new 16-page booklet of Holcroft & Company shows and describes their line of controlled atmosphere heat treating furnaces. Bulletin Ec-203.

Foundry Sand

A pamphlet recently issued on TAM Foundry Zircon Sand and TAM Zircon Flour contains detailed information on these products of the Titanium Alloy Mfg. Co. Bulletin Hc-90.

Metallographic Reference

Nearly one thousand technical books and reference papers on Optical Principles in Metallography are listed in the new Metal Analyst just released by Adolph I. Buehler. Bulletin Lc-135.

Contour Metal Shaping

A very colorful, plastic-bound booklet containing Job Sheets on metal shaping jobs will be helpful to men in Shipbuilding, Plastics, Silverware, and Automotive fields. Available through Continental Machines, Inc. Bulletin Lc-170.

Compressor Data

General information on the application of blowers to gas and oil burners, and miscellaneous applications for other types of work are included in a 12-page "Turbo Compressor Data Book." Useful tables and charts are included. Spencer Turbine Co. Bulletin Dy-70.

Controlled Combustion

Direct Fired Air Heaters which make possible Controlled Combustion and permit wider range in oven and furnace operation are explained in a 4-page folder by the Despatch Oven Co. Bulletin Lc-123.

Burners

New and up-to-date bulletins by Eclipse Fuel Engineering Co. covering many types of burners as well as their complete listing of products are now available. Bulletin Lc-226.

Tremendous Trifles

Another of International Nickel's instructive folders on Monel Metal covering actual case studies of the use of Monel is now available. Bulletin Lc-45.

Optical Pyrometer

The first industrial Optical Pyrometer to use the potentiometer method of measurement is featured in an interesting and instructive booklet published by Leeds & Northrup Co. Bulletin Lc-46.

Tocco Process

The marvel of all heat treaters—the Tocco Process of Induction Hardening—is fully described in a colorful folder by the Ohio Crankshaft Co. Bulletin Lc-145.

Machining Data

A new chart giving the correct grade of Kennametal for machining 21 types of metals, with recommended cutting speeds, has just been made available by McKenna Metals Co. Bulletin Lc-238.

More Dust Hog

Those who have been following the Dust Hog series of the Pangborn Corp., which analyzes the cost of dust to industry, will appreciate the fifth and sixth folders of the series which are now available. Bulletin Lc-68.

Potentiometer Controller

A series of controllers adapted to actuate any customary type of fuel valve or electric contactor is described in a bulletin by Wheeler Instruments Co. Bulletin Lc-110.

The Review

7016 Euclid Ave., Cleveland

Please have sent to me without charge or obligation the following literature. (Circle the numbers that interest you. It is important to write in your company or business connection when you return this coupon.)

Name Title

Company

Company Address

COL. 1	COL. 2	COL. 3	COL. 4
Fa-35	Jy-11	Bb-71	Ca-50
Dy-6	Fb-46	Ka-103	Lb-25
Oy-140	Ea-167	Fx-32	Ec-113
Lb-30	Cc-86	Gb-29	Gc-245
Ca-51	Ka-18	Kc-59	Ac-87
Ka-53	Ge-187	Kc-163	La-23
Ob-80	D-17	Kc-106	Ec-203
Lc-12	He-24	Kc-76	Hc-90
Da-63	Hc-134	Kc-154	Lc-135
Ka-79	Ma-64	Fb-22	Lc-170
Jy-126	Ka-49	Lb-118	Dy-70
Ar-54	Bb-124	Ha-169	Lc-123
Ox-16	Ax-4	Dc-29	Lc-226
Lc-3		Jy-125	Lc-45
		Dc-98	Lc-46
		Bc-85	Lc-145
		Na-138	Lc-238
		Bc-66	Lc-68
		Id-112	Lc-110

Alloy Elements Are Evaluated In Two Classes

Krivobok Groups Them as Those Which Dissolve Ferrite and Those Forming Carbides

By Thomas E. Hamill

Washington Chapter—V. N. Krivobok, of the Allegheny Ludlum Steel Corp. and Carnegie Institute of Technology, returned after several years' absence to give the Chapter its first talk of the year. The title was "Evaluation of Alloying Elements in Steel", given in his usual inimitable style.

The alloying elements were divided into two classes; (1) those which dissolve ferrite and strengthen it and (2) those which tend to form carbides.

In the first group are P, Si, Mn, (strong effect); Ni, Mo, W (medium); and V, Cu, Cr (weak). Those in the second group are Cr, Mo, W, V, Ti, Cb (strong); Mn, Co (medium); Ni (questionable); and P, Cu, Si and Al (no carbides formed).

The elements were also classified according to (1) their effect on the eutectoid carbon composition, (2) refining of microstructure, (3) restraining of grain growth, (4) resistance to tempering, and (5) tendency to cause precipitation hardening.

Alloys Increase Strength and Hardness

In general, alloy additions increase both the tensile strength and hardness of the steel but at different intensity.

The characteristics of the various carbides were classified according to:

1. Tendency to resist tempering or softening at elevated temperatures (stability).
2. Rates of solution in austenite.
3. Tendency to precipitate out of solid solution.

The stability of carbides was studied by tempering steels of the same alloy content to various temperatures for the same length of time and by heating alloy steels for various lengths of time at the same temperature. Hardness-temperature or time curves were then obtained.

Size of the carbides has a great effect on their time-temperature solution, small carbides dissolving quicker than larger ones. Depth-hardness curves on a nickel-chromium steel showed the higher quenching temperature to produce the highest and greatest depth of hardness even though the time at temperature was less than that at the lower quenching temperature.

Creep Illustrated

The effect of alloying elements on high temperature properties of steel may be determined by creep tests and short time tests. Creep strength depends on microstructure before test, chemical analysis and the physical characteristics of the steel.

Photographs were shown of two tensile specimens of the same steel broken at 1500° F. One had 21% elongation, the other 106% elongation. The differ-

"Tocco" Process Is Reported

By R. A. Thompson

Indianapolis Chapter—At the regular meeting on Monday evening, Oct. 16 at the Washington Hotel, W. E. Benninghoff of the Ohio Crankshaft Co. discussed the "Tocco" process.

A lively question and discussion period followed his talk, which is reported on page 4.

The movie taken at the joint picnic with the Muncie Chapter last June was also run and recalled the good time had by all at this gathering.

Cups Awarded at Chicago Tournament



Following the Tenth Annual Golf Tournament of the Chicago Chapter Held on August 26, the Inter-Chapter Cup Was Presented to the Ft. Wayne Team. Shown receiving the cup are G. B. Kiner, E. Franke, J. H. Clark, and G. Miller. Behind the table is E. A. Terwell, secretary of the Chicago Chapter. The Al Lindberg Trophy was won by the Columbia Tool Steel group.

ence in ductility was due to difference in grain size and the oxidation beginning at the surface and progressing along grain boundaries.

The elements which cause depth of hardening were divided into four classes: Strong, medium, weak and questionable. Those which refine the grain cause shallow hardening.

The effect of different grain sizes on the depth of hardening of a 1% Mn steel showed the coarser grain to produce somewhat greater depth of hardening while a 1% Mn steel of low carbon content produced considerably greater depth of hardening than a plain low carbon steel of the same grain size.

Dr. Krivobok concluded his talk by showing a mass-hardness chart for numerous alloy steels.

The Chapter was very fortunate in securing Capt. G. K. Heiss of the War Department who gave a coffee talk on "Strategic Materials".

He stressed the importance of industrial mobilization at the beginning of a war, including arms, food, clothing, and equipment, and told of the creation of the Army and Navy Munitions Board by the Assistant Secretary of War.

The duty of this Board is to separate the work of the bureaus so that there is no overlapping and to determine the Army, Navy and civilian needs.

In mobilizing a nation for war, raw materials are probably most important.

Captain Heiss stated that by discovering substitutes and discarding obsolete equipment, this country reduced the number of strategic materials from over 60 in 1920 to 17 at the present time.

Grossmann's Hardenability Interests New Haven Men

By S. J. Morgan

New Haven Chapter—At the Oct. 12 meeting Marcus A. Grossmann, director of research, Carnegie-Illinois Steel Corp., spoke on "Hardenability".

Dr. Grossmann discussed a method which was devised in the laboratories of the Carnegie-Illinois Steel Corp., for measuring hardenability quantitatively and at the same time ascertaining in numerical values the severity of quench employed in such tests. This method is described in detail in the "Hardenability Symposium" published by the A.S.M.

The talk was illustrated by charts and lantern slides, and the number of questions and discussions at the end of the lecture was proof that the subject was one of great interest to the members of the Chapter.

What, How, Why and Where of Powder Metallurgy Explained

By A. F. Whalen

York Chapter—At Hostetter's Play Barn, on the evening of Oct. 10, the Chapter held its annual Lancaster Night. Most of the good things on the dinner table came from near-by farms.

R. L. Patterson, vice-president of Hardy Metallurgical Co., New York, presented a talk on powder metallurgy.

Since the subject was practically unfamiliar to most of those present, the speaker presented it under the four simple heads of what, how, why and where—what it is, how metal powders are made, why they are used, and where they find their field of usefulness.

Under "what" he explained that powder metallurgy is the art of making forms or products from powder by hot or cold compression, and then sintering by heat in protective atmospheres.

Ten Ways of Obtaining Powders

Under "how" he explained at least ten methods of obtaining the powders such as grinding, stamping, precipitation, reduction, atomization, spraying, carbonyl gas, and electrolysis.

The powders are then mixed and compressed into the desired shape, at pressures from 10 to 50 tons per sq. in. Then comes sintering and the start of some beautiful headaches for the manufacturer. In some products the atmospheres have had to be changed three or more times to get satisfactory results.

Under "why" he described the ease by which two or more different metals can be mixed for alloying; the use of metals and non-metals in the same product; the ability to produce metallic objects free from gas pockets, pipe, and slag inclusions and other defects; and the ability to produce hard substances in soft settings or vice versa.

Under "where" it is used he produced an exhibit of products mounted upon boards ranging all the way from a World's Fair Medal to low nickel-chromium steels with a tensile strength of 125,000 psi.

Small, powerful magnets of an aluminum-nickel-cobalt composition, about the size of thimbles, were passed around, and jumped about two or three times further than the holders expected them to. Every product shown was a former problem that had been solved only by great thought and patience.

Aluminum Is of Lively Interest In Los Angeles

Welty and Pyne Discuss Two Aspects as Related to Aircraft

By Roy E. Paine

Los Angeles Chapter held an enthusiastic meeting on "Aluminum and Aluminum Alloys" on Oct. 12.

Subjects for discussion were "Aluminum Forgings and Castings as Used in the Aircraft and Related Industries" by G. D. Welty, and "Strong Alloys of Aluminum as Used in Aircraft Design" by F. C. Pyne. Both are with Aluminum Co. of America, Mr. Welty in Cleveland and Mr. Pyne in Pittsburgh.

Any discussion of aluminum and its alloys is always of lively interest in Los Angeles and Mr. Welty and Mr. Pyne presented a broad picture of the subject.

Mr. Welty explained that for the important structural and machine applications the metal aluminum cannot be used without alloying with some other metal. There are six common elements that are most important for this purpose—copper, silicon, magnesium, manganese, zinc, and nickel.

Copper is the oldest and most important of these and is used for both wrought and cast alloys. It is the major alloying element in alloy No. 12, which has had continued use for over 20 years, and in the original strong wrought alloy, duralumin.

Silicon in Die Casting Alloys

Silicon was not originally an important element in aluminum casting alloys until after a number of years of experimental work and the advent of tungsten carbide cutting tools.

The silicon alloys are important to the die casting industry where high fluidity is useful in the production of castings of thin section.

Mr. Welty discussed in some detail the mechanics of the solution heat treatment operation, followed by room temperature aging or precipitation heat treatment.

Finally, he discussed some of the applications of aluminum alloy castings and forgings in aircraft.

There are about 500 lb. of aluminum alloys in a 1000-h.p. radial engine and about 60% of this material is castings. A major part of these castings are the air-cooled cylinder heads—castings of great complexity.

Forgings and permanent mold castings also are used in the radial engines. Propellers of the forged alloy 25S-T have properties equivalent to those of mild steels.

Strong Alloys for Structures

Mr. Pyne followed Mr. Welty with a discussion of the use of strong alloys in the fuselage and wings of aircraft. The alloys used are few in number and are all of the duralumin or 17S-T type, or the modified 24S-T type.

These strong alloys are used in four general forms, sheet, extruded shapes, wire, rod and bars which are used for rivets and screw machine products and tubing.

Mr. Pyne discussed the production of parts from annealed sheet. The subsequent heat treatment must be controlled carefully as to temperature and time and parts must be quenched rapidly from the solution heat treatment to provide satisfactory resistance to corrosion.

Large amounts of strong alloy sheet are used in the Alclad form. This consists of a core of strong alloy with a coating of pure aluminum of about 5% of the total thickness. Alclad sheet offers high resistance to corrosive action.

Discusses Light Alloys Of Aluminum, Magnesium

By C. B. Brodie

Schenectady Chapter held its first meeting of the season on Sept. 19 at the Watervliet Arsenal Clubhouse, Watervliet, N. Y.

Professor Robert S. Williams, head of the department of metallurgy, Massachusetts Institute of Technology, was the guest speaker, choosing as his subject "The Light Alloys".

The strength of both aluminum and magnesium is improved by alloying, aluminum-copper having been used as a casting alloy for many years, but the remarkable progress in the aluminum industry followed the development of duralumin in Germany in 1909.

There are three kinds of duralumin—containing copper and magnesium, silicon and magnesium, or all three.

Magnesium and aluminum form a series of alloys comparing favorably with duralumin except that they are less resistant to corrosion.

Gas Furnace Developments Are Traced at Oregon

By B. F. Sawyer

Oregon Chapter—Forty-six members and guests were present for dinner at the meeting on Sept. 15, and about a dozen more arrived for the technical meeting at 8:00 p.m.

Chairman Peck read a list of committee appointments for the coming year, and an announcement of two new lecture courses which the Society offers.

The speaker of the evening was Charles A. Blesch, of the Surface Combustion Corp., San Francisco. He gave a very interesting talk on industrial gas furnaces, well illustrated with a number of slides.

Mr. Blesch traced the development of the gas furnace and described several gas burners of the pre-mix and diffusion types. He also had some interesting information on furnace refractories and on controlled atmospheres.

Mr. Blesch's talk prompted considerable discussion.

BOOKS YOU NEED FOR REFERENCE

The books listed below are written by outstanding men in the metal field. They deserve a place on your reference shelf. To order, just fill in coupon at bottom and mail.

FORGING HANDBOOK...by Waldemar Naujoks and Donald C. Fabel
The first book to cover the entire forging field—design, processes, materials, tools and dies, new developments.
630 Pages, 6 x 9, 400 Illustrations, Red Cloth Binding.....\$7.50

HARDENABILITY OF ALLOY STEELS
Papers presented at the Detroit hardenability symposium. 300 Pages, 161 Illustrations, Cloth Binding, 6 x 9.....\$3.50

INDEX...All the technical articles in TRANSACTIONS and METAL PROGRESS.
Complete index, 1922 thru 1932.....\$1.00
Complete index, 1927 thru 1932.....\$1.00

CARBURIZING...Written by 16 outstanding men in the metal industry with oral and written discussions by 43 authorities.
400 Pages, 200 Illustrations—Cloth Binding, 6 x 9.....\$4.00

OPEN-HEARTH STEEL MAKING...by Earnshaw Cook
A complete reference volume on open-hearth steel making in a form which makes you want to read it through immediately.
230 Pages, 60 Illustrations—Cloth Binding, 6 x 9.....\$2.50

ENGINEERING ALLOYS...by N. E. Woldman and A. J. Dornblaser
At your finger tips the tradenames, the properties, the composition, the uses and the manufacturers of 8206 important commercial alloys from all over the world.
622 Pages—Cloth Binding, 6 1/2 x 9 1/4.....\$10.00

APPLICATION OF SCIENCE TO THE STEEL INDUSTRY...by W. H. Hatfield
Review of British steel making and rolling practice.
154 Pages, 6 x 9—Cloth Binding.....\$2.50

PRINCIPLES OF HEAT TREATMENT...by M. A. Grossmann
An intensive educational course devoted to the fundamental laws and current practice of heat treating steel.
141 Pages, 6 x 9—Cloth Binding.....\$2.50

LECTURES ON STEEL AND ITS TREATMENT...by John F. Keller
A blacksmith who by long and careful study has mastered the mysteries of iron and steel so that he makes them understandable through homely similes and everyday comparisons.
329 Pages, 6 x 9—Cloth Binding.....\$3.50

TOOL STEELS...by James P. Gill
A series of five educational lectures on the selection, properties and uses of commercial tool steels.
136 Pages, 6 x 9—Cloth Cover.....\$2.50
Paper Cover.....\$2.00

THE BOOK OF STAINLESS STEELS...edited by E. E. Thum
New and enlarged second edition. Written by 32 experts, the book contains 813 pages with 292 illustrations.....\$3.00

METALLURGICAL DIALOGUE...by Dr. Albert Sauveur (Autographed)
A unique and informal method of presentation wherein a master answers his

pupil's question as to "why steel hardens when plunged red hot in cold water."
200 Pages, 5 1/2 x 8, 12 illustrations—Cloth Binding.....\$3.00

STEEL PHYSICAL PROPERTIES ATLAS...by C. Newman Dave
Accurate physical characteristics of steels are available at a glance in this authoritative reference book.
90 Pages, 8 1/2 x 11, very heavy paper—Cloth Binding.....\$2.50

THE WORKING OF METALS...Seventeen papers by leading authorities in the metal world presented at the two-day Cleveland Symposium on Plastic Working.
469 Pages, red cloth, 6 x 9.....\$3.00

PHYSICAL TESTING OF METALS...by H. D. Churchill
Fundamental principles, application, interpretation of various tests. Contains 110 pages, illustrated by 25 charts and photographs, 6 x 9.....\$2.00

GRAIN SIZE SYMPOSIUM...Papers presented by 16 authorities at the National Metal Congress on grain size studies and the control of grain size in ferrous metals.
335 Pages, 6 x 9—Cloth Binding.....\$2.50

CONSTITUTION OF STEEL AND CAST IRON...by F. T. Sisco
Explaining in a clear understandable manner the metallurgical functions of carbon and the common alloying elements.
332 Pages, 6 x 9—Cloth Binding.....\$3.00

INCLUSIONS IN IRON...by C. R. Wohrman
A careful study of the common inclusions, their nature and effect.
162 Pages, 6 x 9—Cloth Binding.....\$3.00

NITRIDING SYMPOSIUM...Papers presented by several authorities at one of the recent Conventions of the Society.
222 Pages, 6 x 9—Cloth Binding.....\$1.50

THE QUENCHING OF STEELS...by H. J. French
Throws further light upon the laws of cooling, especially under conditions simulating those encountered in the practical heat treatment of steels.
177 Pages, 6 x 9—Cloth Binding.....\$2.50

HEAT TREATMENT, USES AND PROPERTIES OF STEEL...by H. B. Knowlton
Covers the various plain carbon and alloy steels, their selection and properties obtainable by various treatments.
457 Pages, 6 x 9—Cloth Binding.....\$4.50

METALLOGRAPHIC TECHNIQUE FOR STEEL...by J. R. Vilella
This book was written with the aim of showing exactly how structures of steel are affected by the various operations involved in the metallographic process.
85 Pages, 90 illustrations, 6 x 9—Red Cloth Binding.....\$2.00

MACHINING OF METALS...Five lectures on machinability delivered at the Detroit Metal Congress.
177 Pages, 6 x 9, 132 illustrations—Red Cloth Binding.....\$2.50

CHAPTER CALENDAR

CHAPTER	DATE	PLACE	SPEAKER	SUBJECT
Baltimore	Dec. 18	Engineers Club	W. J. Jeffries	Materials—Navy Construction
Boston	Dec. 8	M.I.T. Room 6 120	Hans Ernst	Metal Cutting Research
Buffalo	Dec. 14	Hotel Buffalo	M. A. Grossmann	Hardenability and Quenching of Steel
Calumet	Nov. 21	Woodmar Country Club, Hammond, Ind.	Clarence W. Balke	Powder Metallurgy
	Dec. 19	Woodmar Country Club		New Developments in Steel Making
Canton-Mass.	Dec. 14	Hotel Onesta, Canton, Ohio	H. H. Harris	Heat and Corrosion Resistant Alloys
Chicago	Dec. 14	Medinah Club	A. W. Winston	Magnesium Base Alloys
Cincinnati	Dec. 14	Hotel Alms	J. P. Gill	Tool Steels
Cleveland	Dec. 4	Cleveland Club	J. R. Vilella	Metallography
Columbus	Dec. 12		J. P. Gill	Tool Steels
Dayton	Dec. 13		J. P. Gill	Tool Steels
Detroit	Dec. 11			Christmas Party
Hartford	Dec. 12			Christmas Party
Indianapolis	Dec. 18		A. B. Kinzel	Mechanical Testing
Los Angeles	Dec.		V. N. Krivobok	Stainless Steels
Milwaukee	Nov. 21	Milwaukee Athletic Club	W. P. Eddy, Jr.	Automotive Service Failures
	Dec. 19	Milwaukee Athletic Club	A. O. Schaefer	Heavy Forgings
Montreal	Dec. 4	Windsor Hotel	A. B. Kinzel	Role of Alloys in Steel Making
Muncie	Dec. 14	The Mounds, Anderson, Ind.		Christmas Party
New Haven	Dec. 7	Conn. Light & Power Co., Waterbury	G. E. Platzer	Bearing Materials
New Jersey	Dec. 18	Essex House, Newark		Smoker
New York	Dec. 11	Building Trades Employers' Association Club Room	P. Payson	Alloy Additions to High Alloy Steels
North West	Dec. 6	Minnesota Union	F. J. Robbins	Leaded Steels
Notre Dame	Dec. 13	Engineering Auditorium, Univ. of Notre Dame	V. J. Bruce	Mechanics of Machining
Ontario	Dec. 1	Hamilton	H. J. French	Recent Progress in Alloy Steels
Oregon	Dec. 21	Portland, Ore.	V. N. Krivobok	Stainless Steel
Penn State	Nov. 30		R. W. E. Letter	Plastic Deformation
	Dec. 14		A. A. Bates	Trends in Modern Metallurgy
Philadelphia	Nov. 24	Engineers Club	J. P. Gill	20 Years of Tool Steel Metallurgy
	Dec. 15			Social Evening
Pittsburgh	Dec. 14	Roosevelt Hotel		Christmas Party
Rhode Island	Dec. 6	Providence Engineering Society	E. E. Legge	Austempering and Wire Manufacture
Rochester	Dec. 13	Lower Strong Audit., Univ. of Rochester	E. A. Rogers	Economical Production of Metal Stampings in Small Lots
Rockford	Nov. 22		Uddeholm Co. of America	Movies of Swedish Steel Plants
	Dec. 13		F. B. Doane	Magnaflux Testing
Saginaw Valley	Nov. 21	Fischer's Hotel, Frankenmuth, Mich.	O. W. McMullan	Heat Treatment for Machinability
St. Louis	Dec. 15	York Hotel	S. C. Lawson	Modern Bronze
Schenectady	Nov. 21	Wolfert's Roost Country Club, Troy, N. Y.	V. N. Krivobok	Evaluation of Alloying Elements in Steels
Springfield	Dec. 18		J. P. Gill	Recent Advances in Tool Steel Metallurgy
Syracuse	Dec. 12	Onondaga Hotel	H. V. Thalden	Stainless in Aircraft
Texas	Dec. 8		V. N. Krivobok	Stainless Steels
Tri-City	Dec. 12	Rock Island Arsenal Auditorium		Party Night
Washington	Dec. 11	Bureau of Standards	A. B. Kinzel	Low Alloy Steels for Welding
Worcester	Dec.			Christmas Party
York	Dec. 13	York, Pa.	Dr. Holt	Salt Baths

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933

Of THE REVIEW, published monthly except July and September at Cleveland, Ohio, for October 1, 1939, State of Ohio, County of Cuyahoga, ss. Before me, a Notary Public, in and for the State and county aforesaid, personally appeared Ray T. Bayless, who, having been duly sworn according to law, deposes and says that he is the Editor of THE REVIEW of the American Society for Metals, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations to wit:

1.—That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, American Society for Metals, 7016 Euclid Ave., Cleveland, O.; Editor, Ray T. Bayless, 7016 Euclid Ave., Cleveland, O.; Managing Editor, M. R. Hyalop, 7016 Euclid Ave., Cleveland, O.; Business Manager, Ray T. Bayless, 7016 Euclid Ave., Cleveland, O.

2.—That the owner is: The American Society for Metals, 7016 Euclid Ave., Cleveland, O., which is an educational institution, the officers being: President, W. P. Woodside; Vice-President, James P. Gill; Treasurer, Bradley Stoughton; Secretary, W. H. Eisenman; Trustees: G. B. Waterhouse, H. A. Anderson, F. B. Foley, S. L. Hoyt, D. S. Clark. All officers as above, 7016 Euclid Ave., Cleveland, Ohio.

3.—That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None.

4.—That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

Ray T. Bayless, Editor.

Sworn to and subscribed before me this 2nd day of October, 1939.
(Seal) Arthur T. Wehrle, Notary Public. (My commission expires Jan. 20, 1941.)

American Society for Metals
7016 Euclid Avenue, Cleveland, Ohio

Gentlemen:
Please send me the books circled above, for which I am enclosing.....in cash (), money order (), check (), purchase order ().

NAME

ADDRESS

CITYSTATE

, 1939

A R

SUBJECT

struction

Research

ility and

g of Steel

etallurgy

ments in

l Making

Resistant

Alloys

se Alloys

ol Steels

ilography

ol Steels

ol Steels

as Party

as Party

Testing

ss Steels

Failures

Forgings

l Making

as Party

Materials

Smoker

to High

oy Steels

ed Steels

Machining

oy Steels

ess Steel

formation

etallurgy

etallurgy

Evening

as Party

and Wire

nufacture

of Metal

mall Lots

l Swedish

el Plants

x Testing

ment for

hinability

n Bronze

Alloying

in Steels

s in Tool

etallurgy

a Aircraft

ess Steels

ty Night

Welding

as Party

alt Baths

REQUIRED

io, for

blic, in

g been

EW of

ge and

ion for

ided by

to witt:

usiness

nd, O.;

Hyslop,

l Ave.

nd, O.

; Vice-

enman;

k. All

holding

ers, and

as they

holder

ne name

aid two

circum-

at upon

DEV

Volu

Ne

Ar

To

Board

Pres

Com

At the

tes of

appoint

commit

nounce

meeting

In or

a roster

they a

time, t

below.

shown

repres

member

Kent R

man

Leslie S

Jay Jeff

G. M. F

J. M. S

Leon D

M

R. S. A

J. E. D

E. L. B

A. D. B

W. Paul

Robert

H. B. P

A. O. S

S. C. S

A. P. S

Lyall Z

H. L. M

John H

tive

C. W. O

Reid L

chairm

Edgar C

A. A. B

William

Harry P

Horace

Walter

R. I.,

L. W. K

Ray T. B

W. H. B

N. Y.,

L. S. B

A. L. B

J. L. B

M. Gens

R. H. H

J. J. K

R. L. M

M. J. R

J. F. O

W. H. S

Sam Tou

John P.

'42

A. W. W

Constitu

C. H. Sh

man, '4

Bernard

Paul Farr